PRECISION MATTHEWS

Digital Readout Operation Manual

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Before use

Dear customer,

Thank you for using BiGa grating digital display, which has been widely applied to milling machine, grinder, wire cutting, lathe, EDM and other equipments. Its application is conducive to improve productivity. Because of its visual display, convenient operation, high accuracy and good repeatability, it has become an indispensable equipment in mould manufacturing, industrial machinery, and delicate measurement instrument.

Pay attention to the following before use

1 Before installation, please open the box and check whether the set of accessories is complete, whether the surface of the digital display is undamaged during transportation. If anything unusual, please contact our company.

2 Before installation, you are supposed to link grating and power, and then check whether the digital display and counting are normal.

3 This equipment is used with alternating current of AC110~220V, 50Hz~60Hz. Power plug is earthed three-pin plug, which must be firmly earthing to avoid instability of digital display.

4 User cannot open the cover so that personal injury is avoided, for high voltage power supply is inside.

5 Please keep the equipment powering off when it is not in use, thus lengthening the duration of service time.

6 Please make sure that the power supply is switched off or the power cord is unplugged in a thunderstorm to avoid high-voltage lightning impacting power grid and leading to power supply of the equipment burning and unnecessary damage due to suddenly increasing voltage.

7 Once the grating used with digital display is damaged, do not link it with other brands of grating, for every company has products of different characteristics, indicators and different ways of wiring. Without the guidance of technician, the digital display cannot be connected with other kind of grating, otherwise, it will cause breakdown of digital display.

8 If the digital display is abnormal, contact BiGa company and distributors. Do not repair by yourself.

Routine maintenance

1 Before cleaning, switch off the power supply.

2 Clean the digital display and protective cover with dry cloth or brush.

3 Do not clean the shell with toluene or ethanol.

4 The shell or display window of the digital display can be cleaned by mixing water and washing powder and drying the towel.

Parameters

Parameter setup function

Instructions: before use, please set up system parameter correctly according to resolution of grating and installation direction. Please do not enter parameter setting state so as to avoid faulty operation, changing parameters that should not be set and affecting normal operation.

Parameter setup routine entrance

Turn on BiGa digital display, and during system initialization (0-9 appear), press 9 key and the command window appear “EXIT”.

Parameter reset 'All CLR'

After enter parameter setup, press ⬆ or ⬇ key and observe info window. After 'ALL CLE' item appears, press “ENT” key. The info window appears 'waiting' and there is a pause of 2min. Then info window appears 'CLR OK', which means parameter reset is finished. Usually, when digital display has malfunction or you forget which parameter has been set, you can use 'All CLR' to return to the original mode.

Shrinkage function setup (Parameter 'SRK OFF' sets up the openness and closeness of shrinkage function.)

Enter parameter setup mode, press ⬆ or ⬇ key to select 'SRK OFF';

Press ENT key, display will interchange between 'SRK ON' and 'SRK OFF'.

Resolution setup

Enter parameter setup mode, press ⬆ or ⬇ key to select 'RESOLUTE';

Press ENT key and the character window will appear '0.005' or '0.001', which is the present resolution;

Press X, Y, Z keys to set up the resolution of X, Y, Z axis respectively;

Each press will interchange between '0.005', '0.01', and '0.001' in character window, then select the resolution needed by pressing ENT key;

Press ENT to return the previous item.

Scale direction setup

Enter parameter setup mode, press ⬆ or ⬇ key to select 'DIRECT' item;
Press ENT key, display will change into 'SEL AXIS';
Press X Y Z to change the direction of X/Y/Z respectively;
Press ENT to finish setup.

'Lin Comp' setup

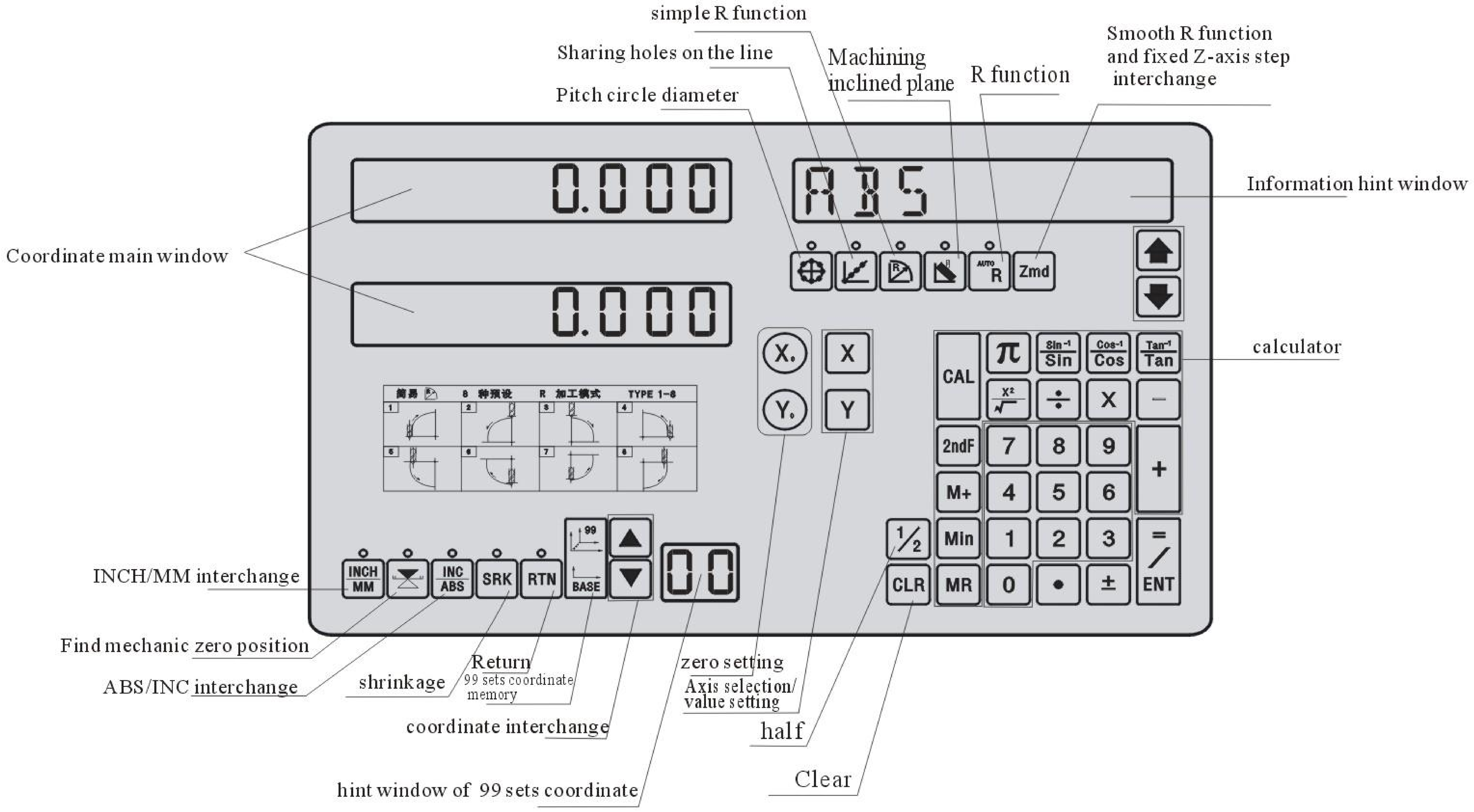
Enter parameter setup mode, press ⬆ or ⬇ key to select 'LIN COMP' item;
Press ENT key to enter 'Lin Comp' setup function. The info window will appear 'ENTER PPM', and character window will appear '0.000';
Press X Y Z to select the axis needed to change;
Input correct value of the selected axis (when error is ±0.01, input value is ±100; error ±0.03, input value ±300);
Press ENT key to conform operation.

Exit parameter setup

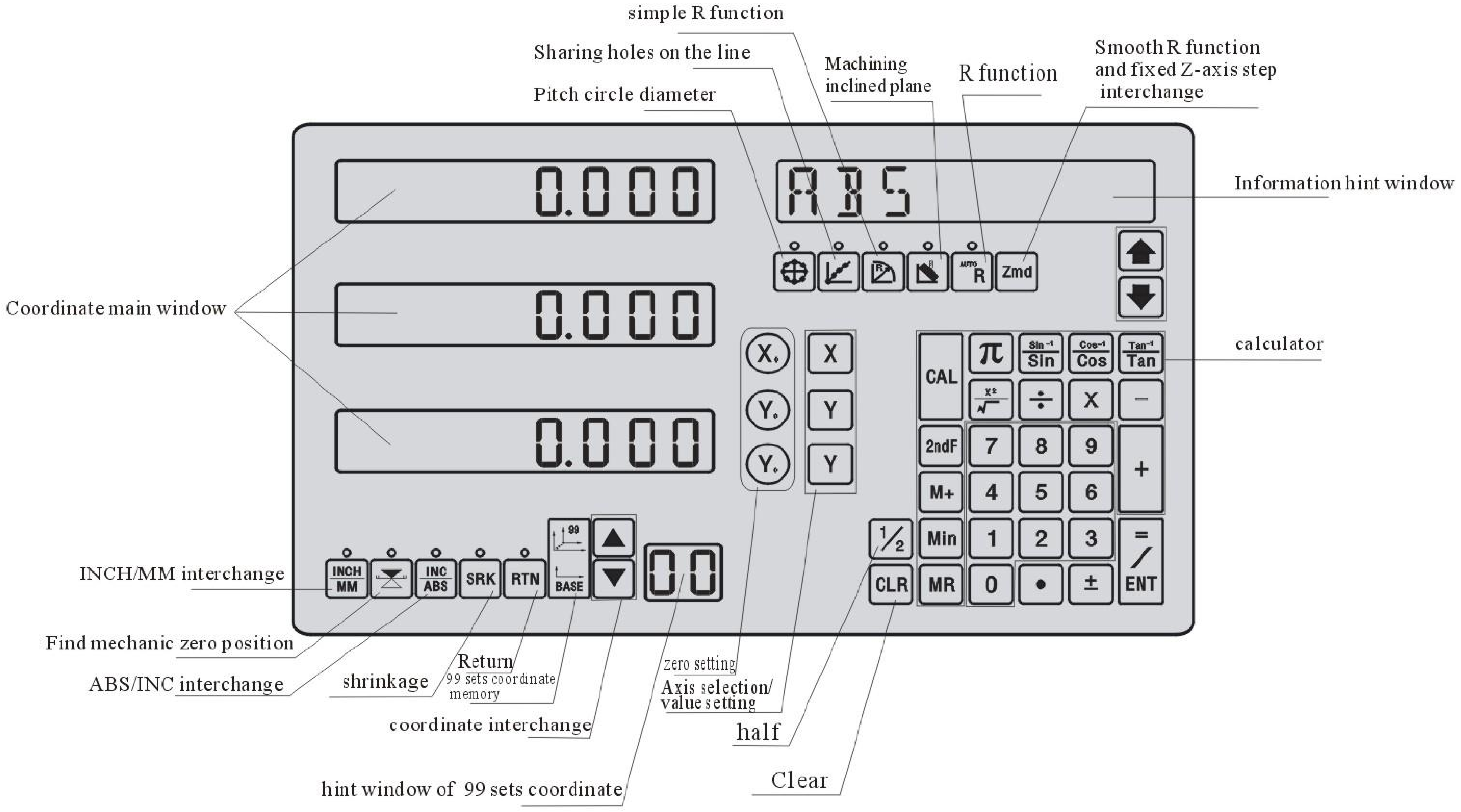
After the above operation is finished, press ⬆ or ⬇ key to select 'Exit'.
Press ENT key to exit parameter function and return to normal mode.
You can also switch off and turn on the display.

Instruction about panel and buttons

Two axis panel function key distribution



Three axis panel function key distribution



Basic function

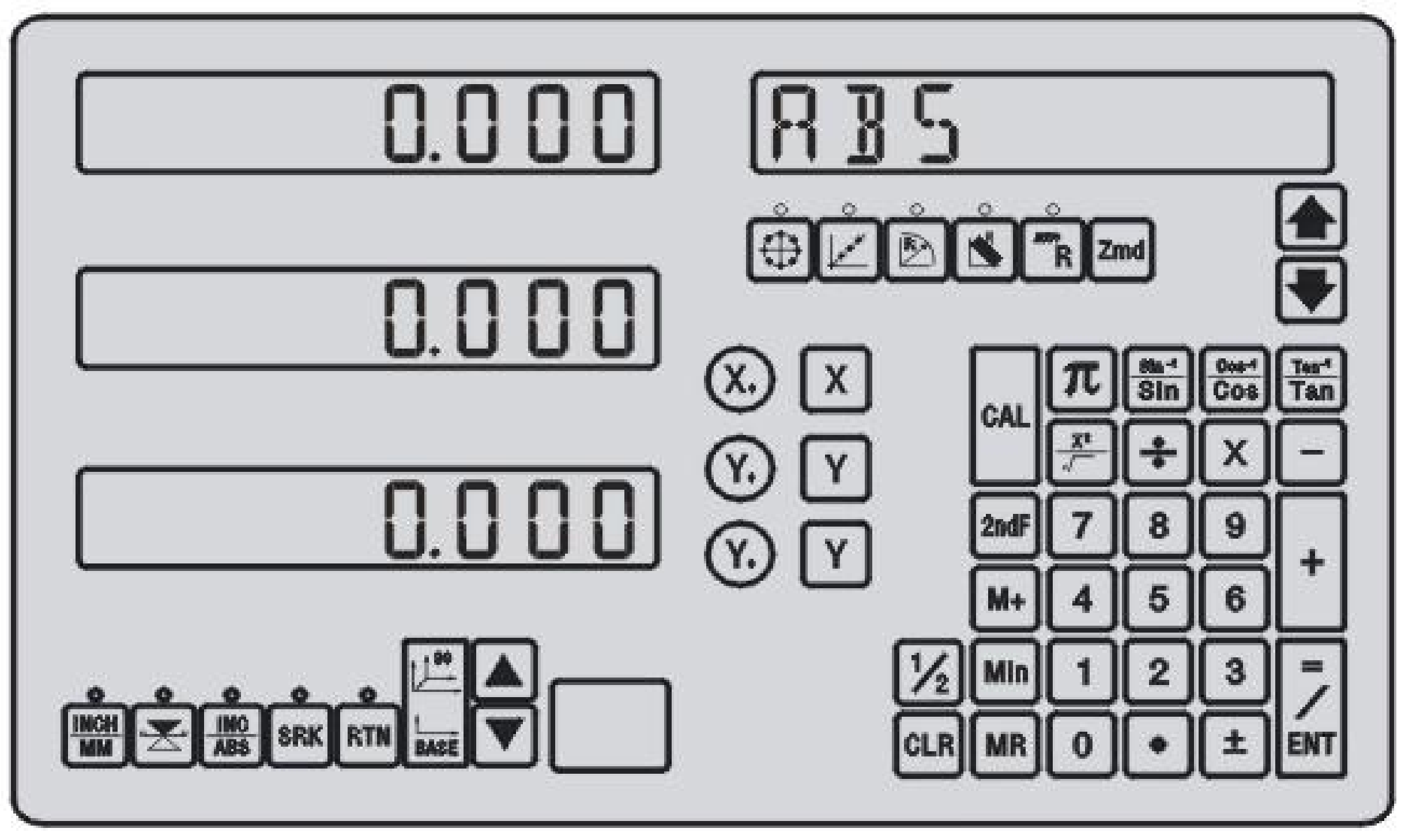
Set to zero

Function: set to zero at any position

Press X_0 → X axis set to zero

Press Y_0 → Y axis set to zero

Press Z_0 → Z axis set to zero

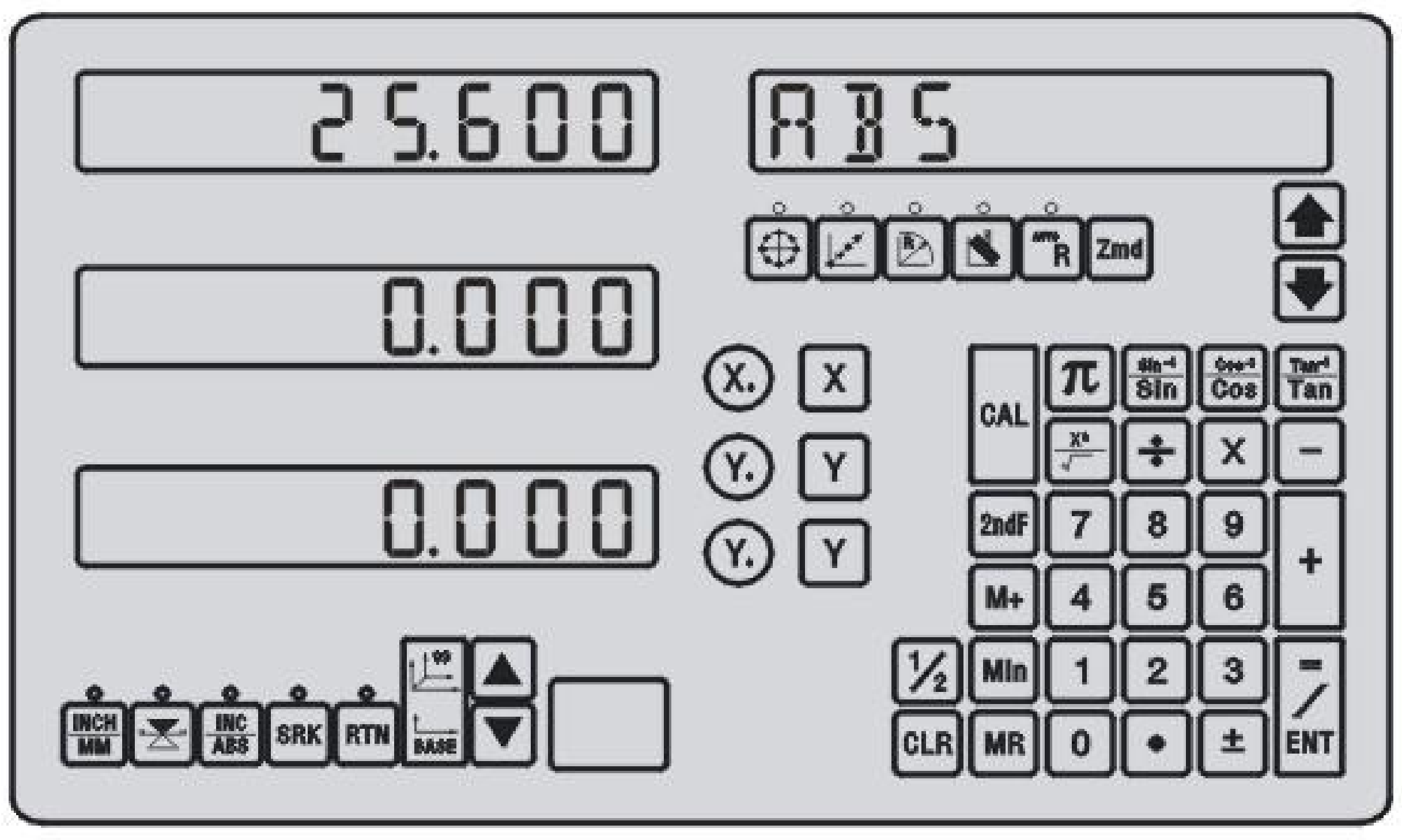


Input coordinate

Function: set any value to the present position of the machine.

Example: X axis set to 25.600mm

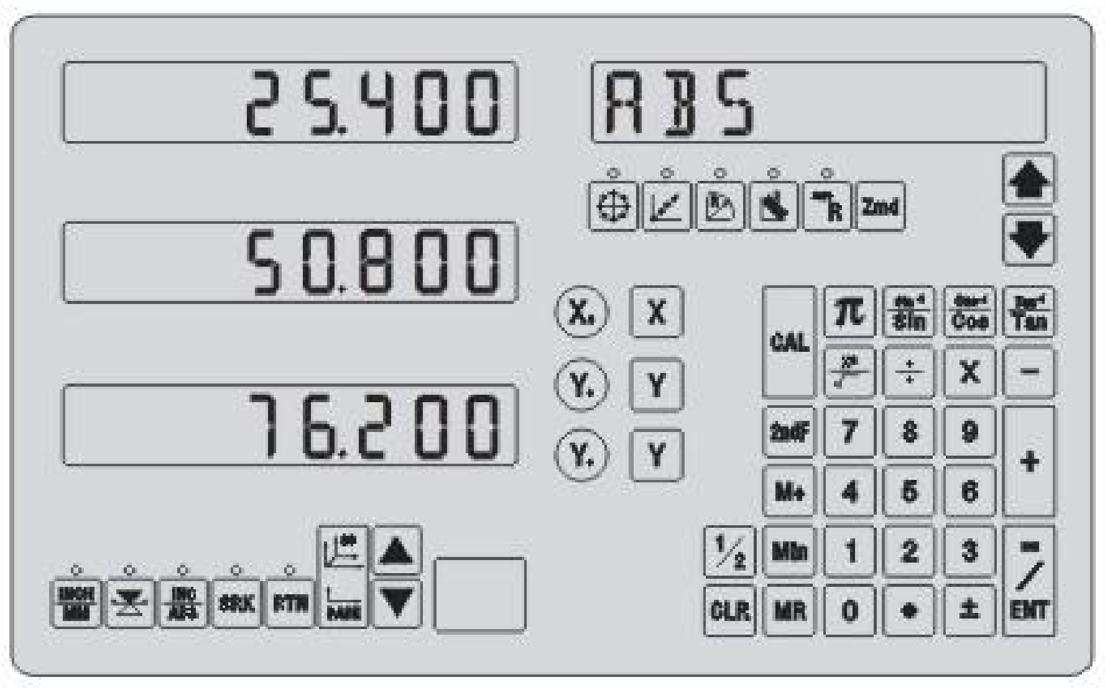
Press orderly: X 2 5 • 6 ENT



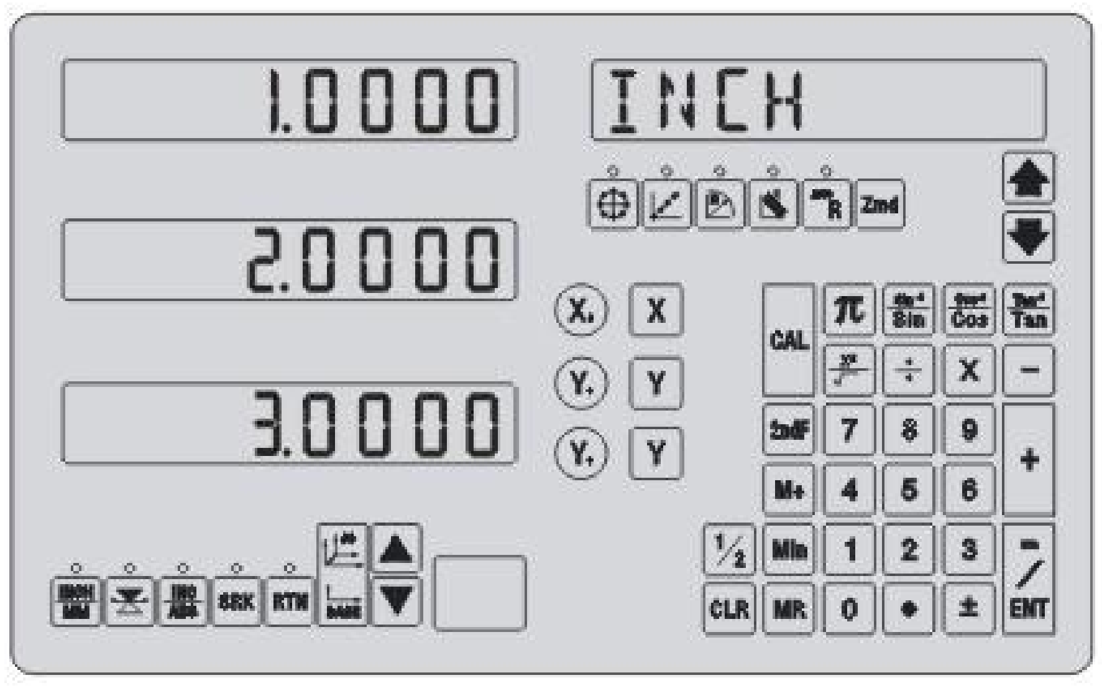
Metric/inch interchange

Function: mm or inch as the measuring unit.

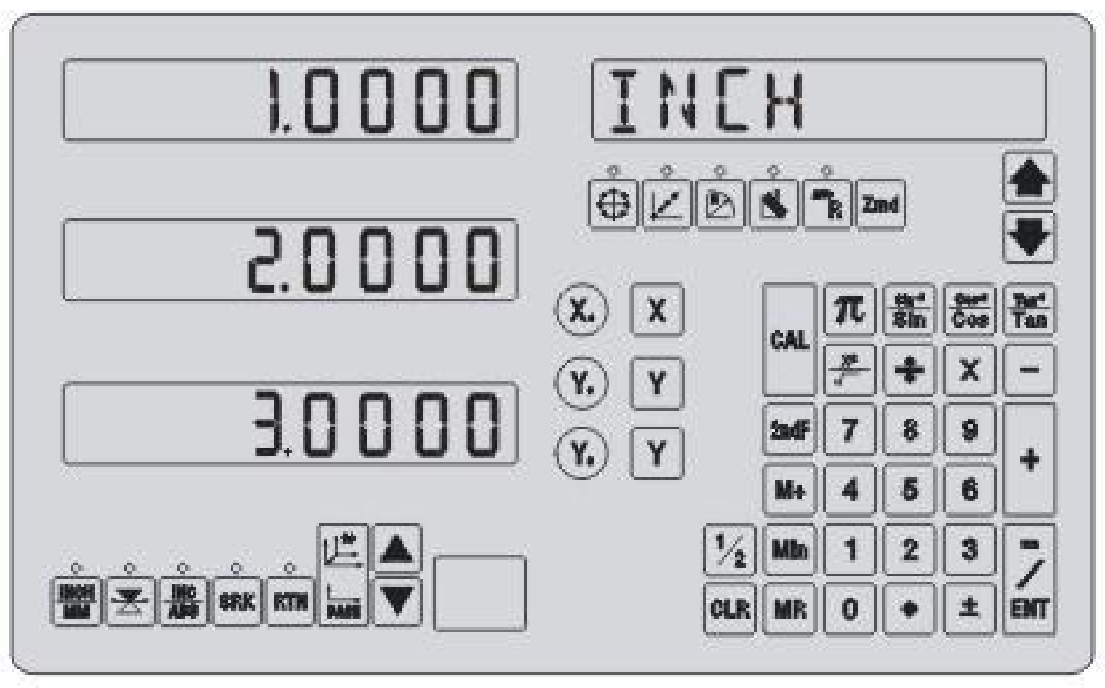
Example: Switch metric to inch



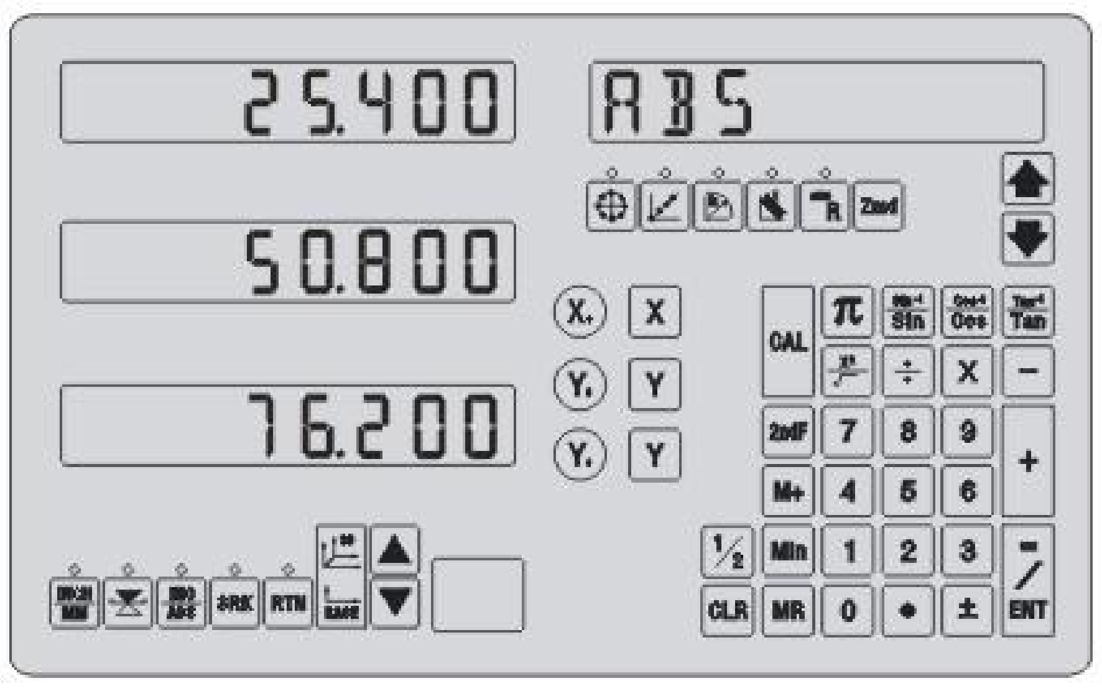
Press INCH/MM →



Switch inch to metric



Press INCH/MM →

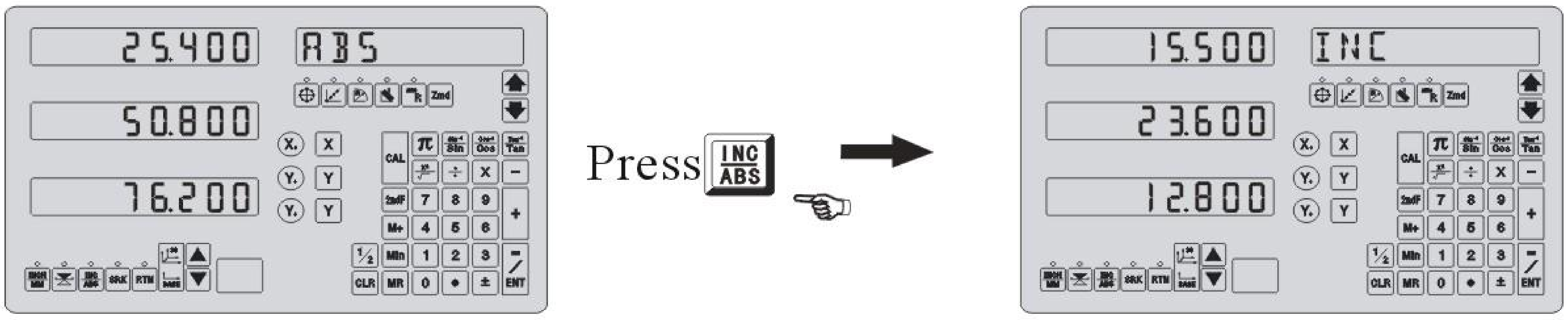


Basic function

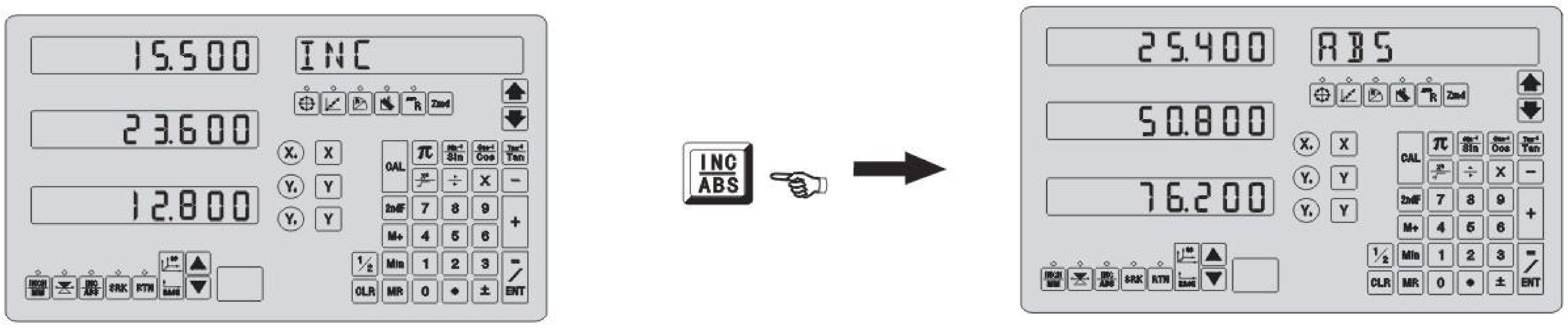
ABS/INC coordinate

Function: digital display provides two sets of basic coordinate display, ABS (absolute) and INC (increment) display.
Operators can memorize datum point on ABS coordinate, and then change to INC coordinate to do machining operation.
Clearing any position on INC coordinate will not influence the whole length that is within ABS and relative to datum point of workpiece Within ABS, the whole length relative to datum point of the workpiece will be stored in the whole process. Operators can check it at any time.

Example: Switch ABS to INCH



Switch INCH to ABS



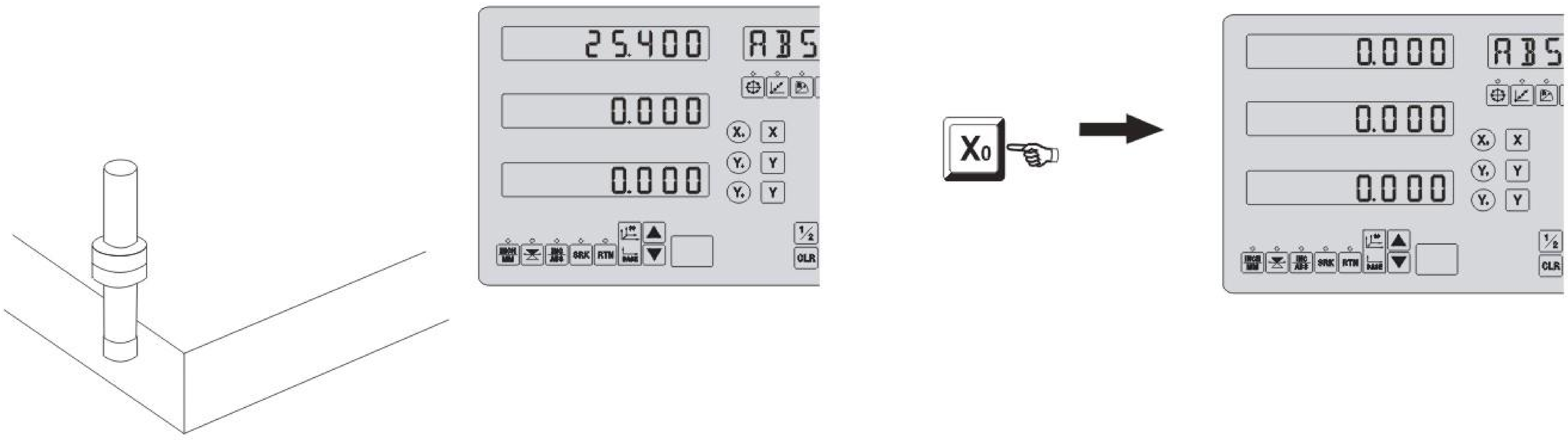
Automatic half

Function: digital display provides automatic half function, the selected axis display is divided by 2, and zero point will be the center of workpiece.

Example: set zero point of X axis as the center of workpiece.

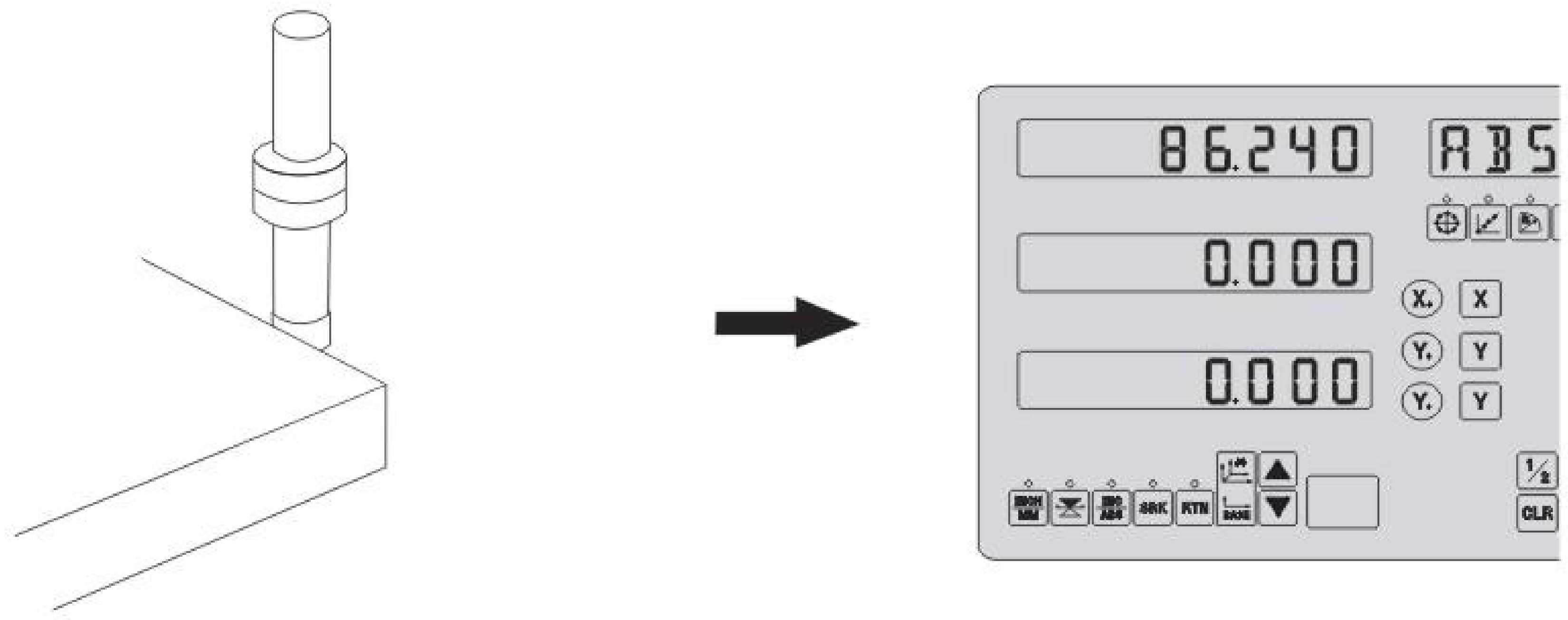
Operating steps:

1 Locate the midsplit stick at one side of X axis and clear to zero.

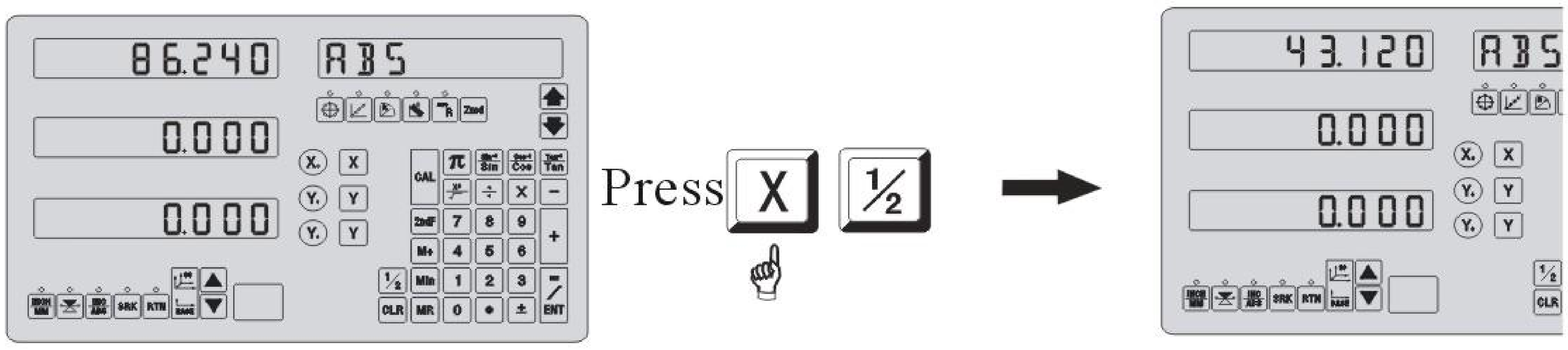


Basic function

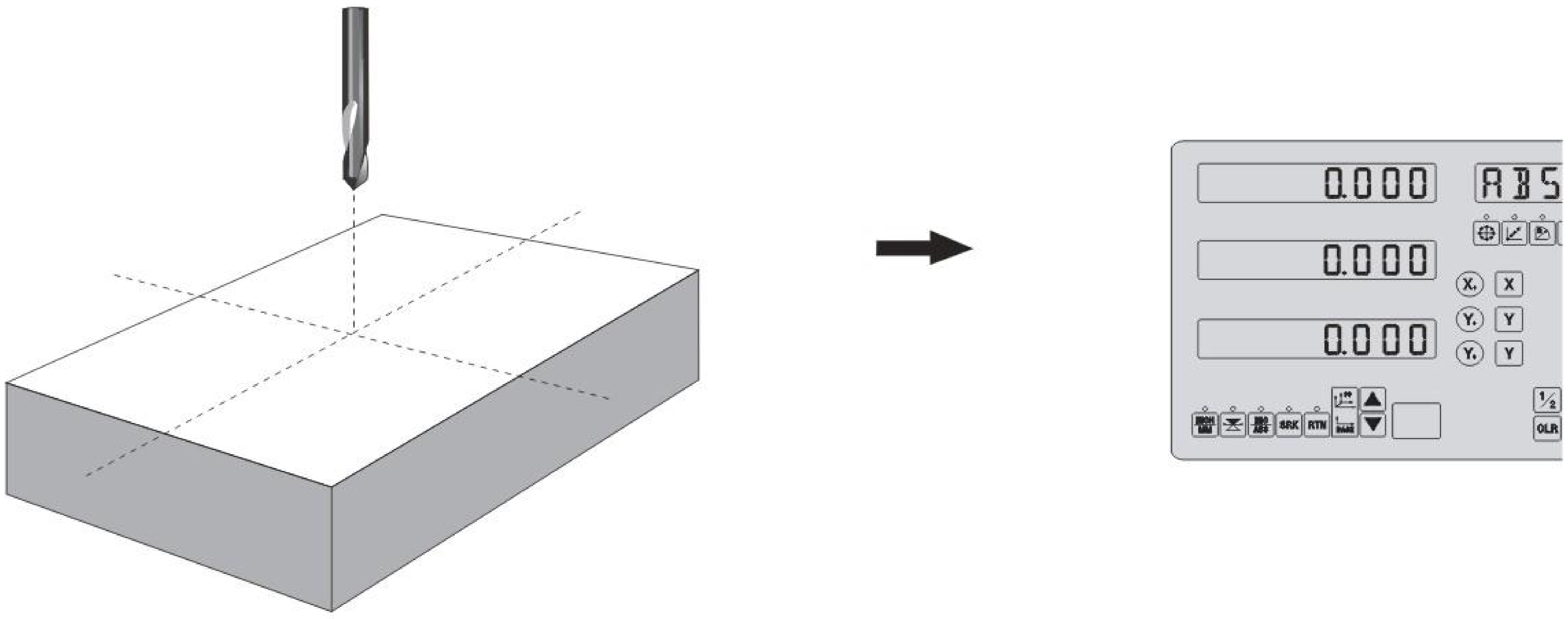
2 Locate the midsplit stick at the other side of X axis.



3 Press half function key and divide the present value of X axis by 2.



4 X axis center of workpiece is 0.000. Locate grating scale to 0.000 and it's the center of workpiece.



Find mechanic zero position

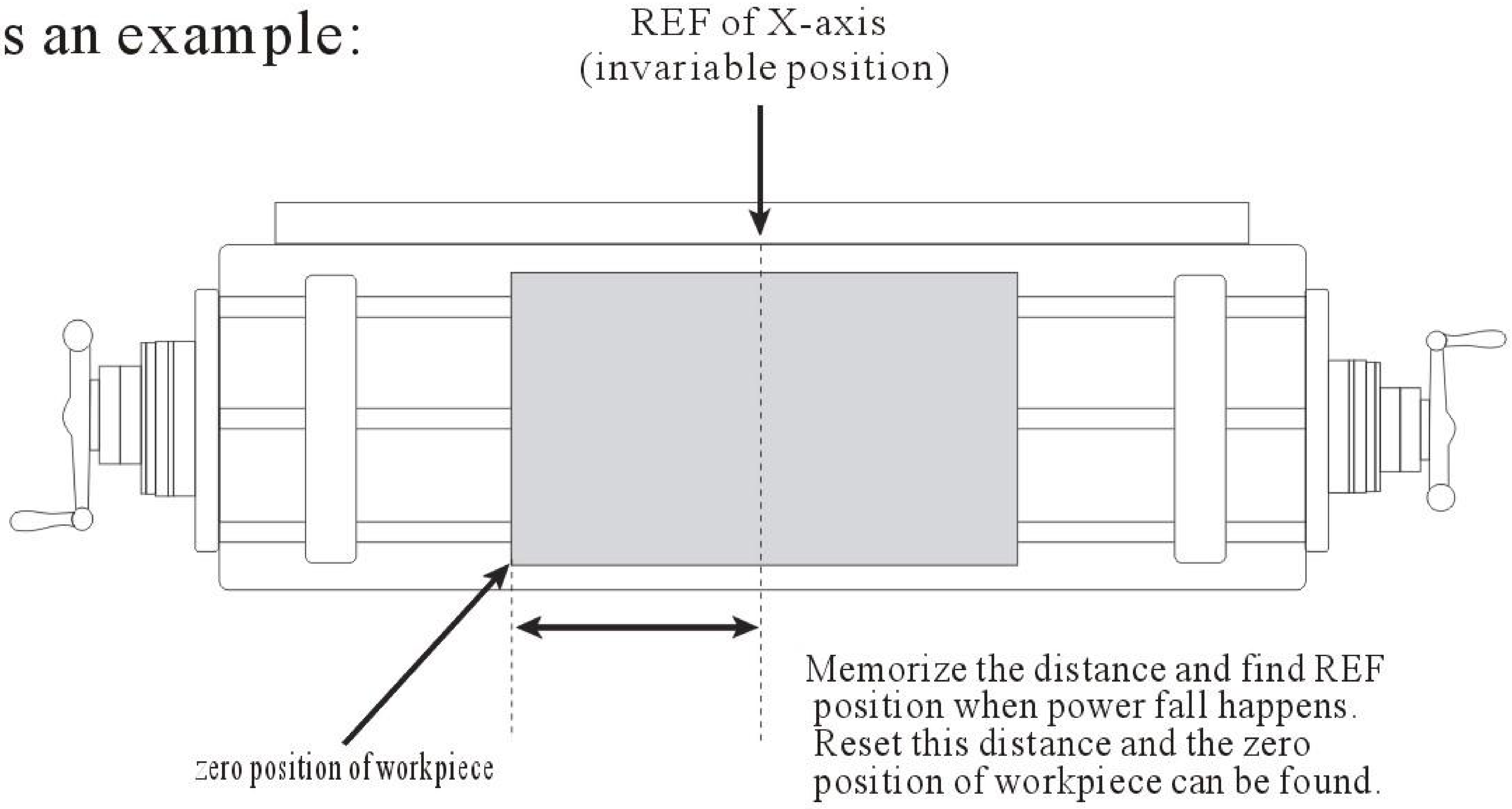
Function: Re-establishing workpiece zero position is very important during daily machining process when power fall happens. This function allows user to catch and memorize grating scale zero position (there is a fixed mark on grating scale zero position) before processing. Users can restore the position when need it.

Principle of memorization of grating scale:

Every grating scale has an invariable zero position in the center. We need only memorize the distance of zero positions of workpiece and grating scale. If the workpiece hasn't been dismantled during power off of grating scale, the distance of zero positions of workpiece and grating scale won't change. Therefore, when restart grating scale, you need only find the zero point of grating scale and reset the memorized distance of zero positions of workpiece and grating scale , and the zero position of workpiece will be found automatically.

Calculator function

Take X axis as an example:



Memorize the distance and find REF position when power fall happens. Reset this distance and the zero position of workpiece can be found.

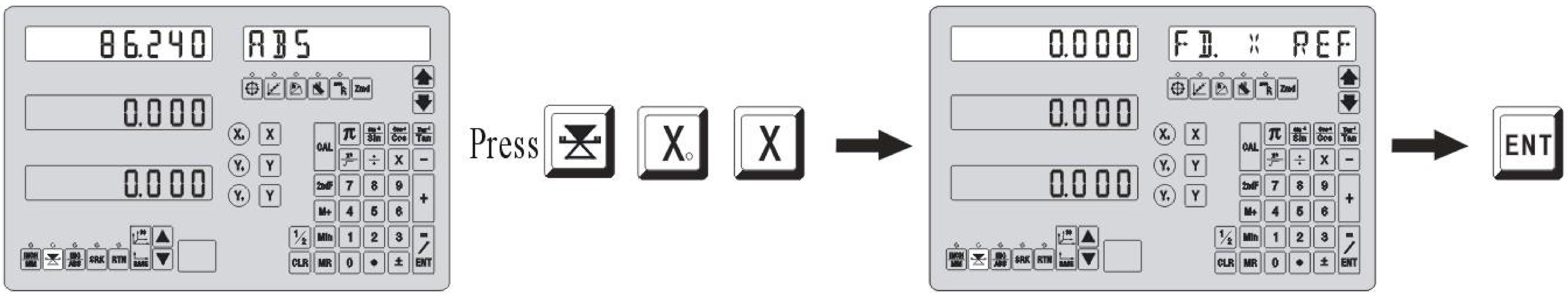
Function instruction: digital display will clear to zero, half and input coordinate automatically in ABS mode. When workpiece zero position function is affected, the distance of zero positions of workpiece and grating scale will be memorized automatically.

Therefore, users need only find the zero position of grating scale before starting digital display and machining.The digital display will memorize the center position of grating scale and process other data storage procedures automatically without manual operation.

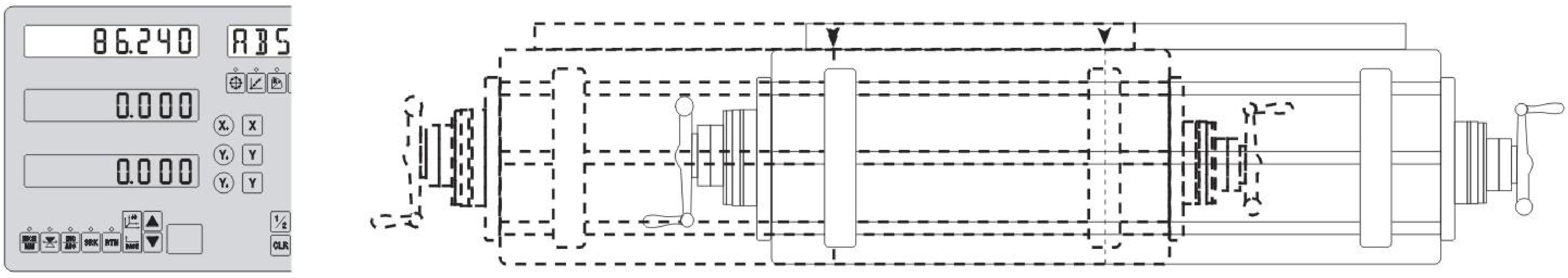
REF

Operating steps(X axis as an example):

Step 1: enter ABS function



Step 2: let workpiece pass the center of scale until the number of digital display stops hopping. The size shown in the digital display is the size relative to REF.

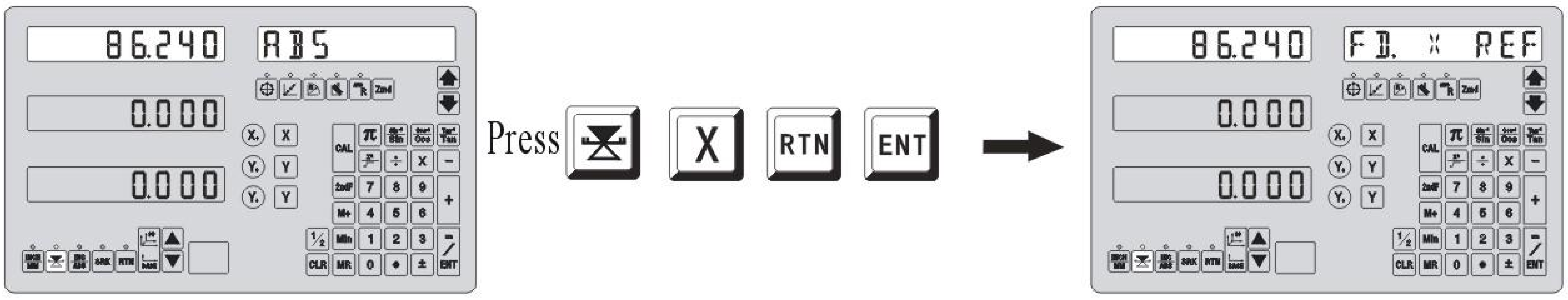


Calculator function

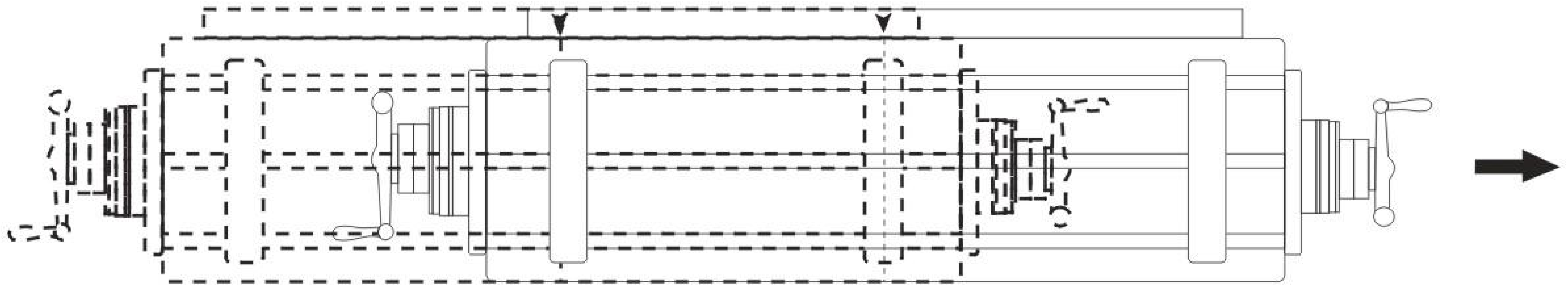
Recall zero

Operating steps:

Step 1: enter ABS function

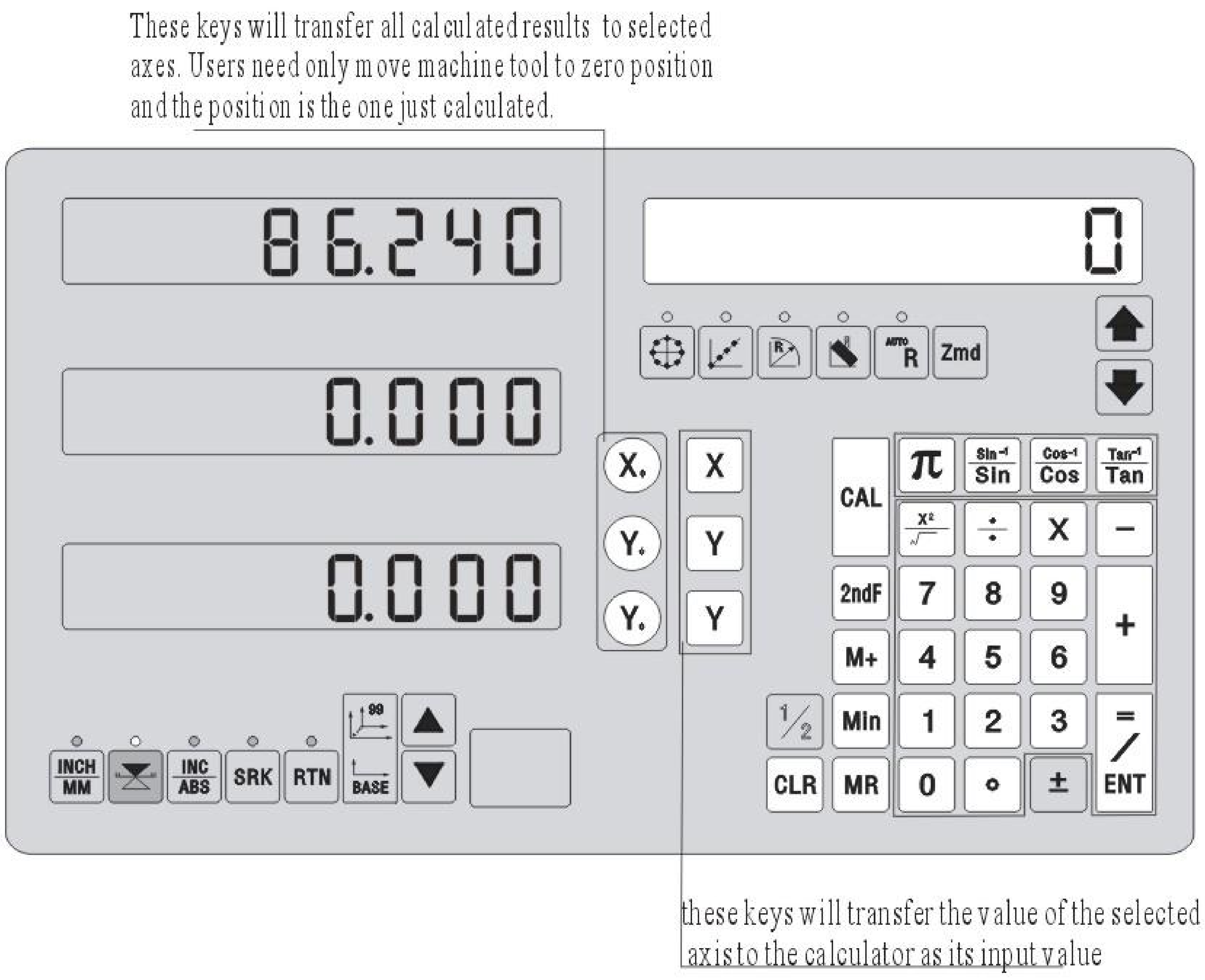


Step 2: let machine tool pass the center of scale until the number of digital display stops hopping. The size shown in the digital display is the size relative to REF.



Calculator function

Functions: in daily machining, the most frequently used tool, except cutters, is calculator. The calculator of digital display not only provides normal mathematical calculations such as ADD, SUBSTRACT, MULTIPLY, DIVISION, but also provides useful trigonometric calculation that are frequently required during process such as SIN, COS, TAN, SQR, inverse SIN, etc. Special RESULT TRANSFER function not only can pick up selected axes' position counting value into calculator as an operator, but also transfer all calculated result to selected axes. Thus users need only move machine tool to zero and the position is the one just calculated.

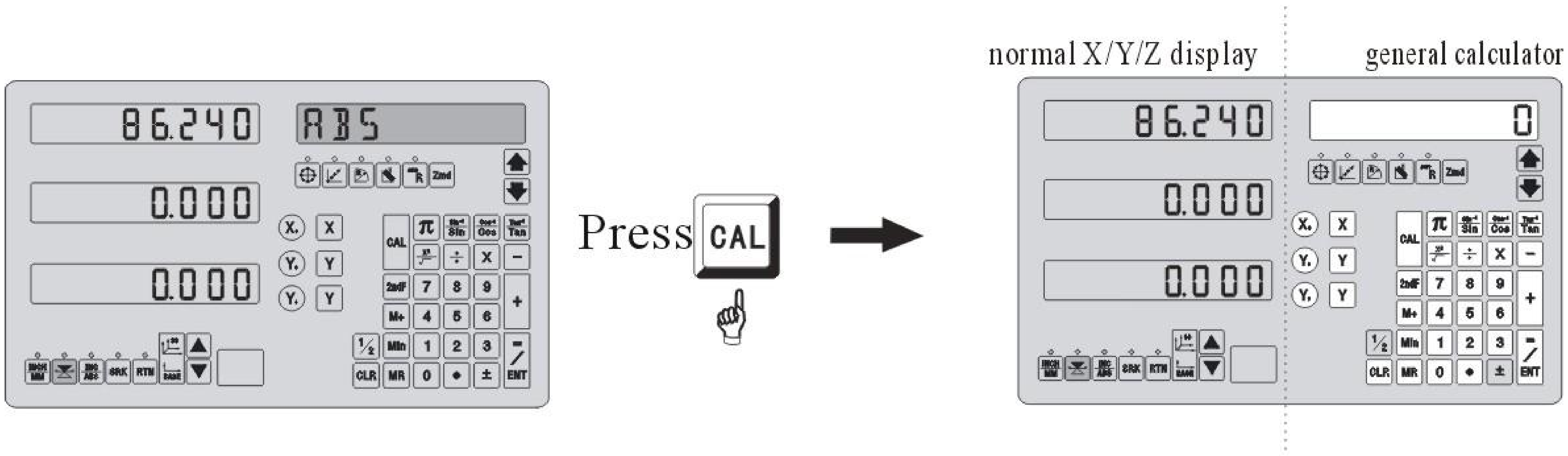


These keys will transfer all calculated results to selected axes. Users need only move machine tool to zero position and the position is the one just calculated.

these keys will transfer the value of the selected axis to the calculator as its input value

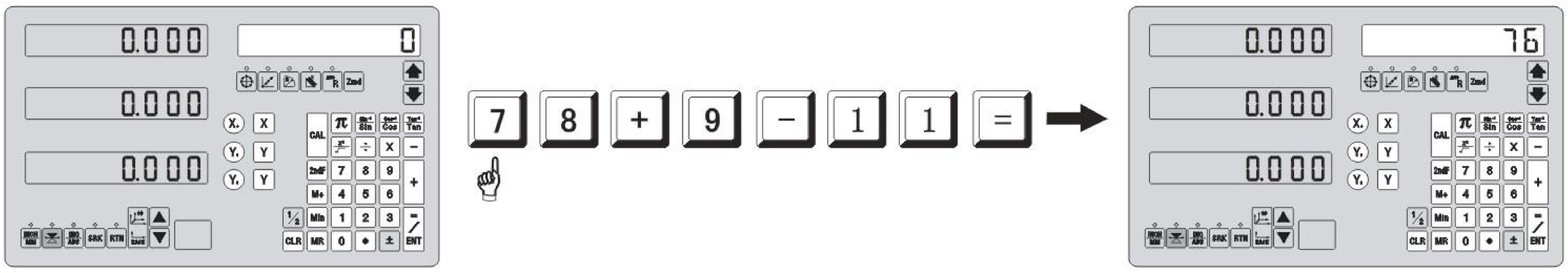
Calculator function

calculator operating method

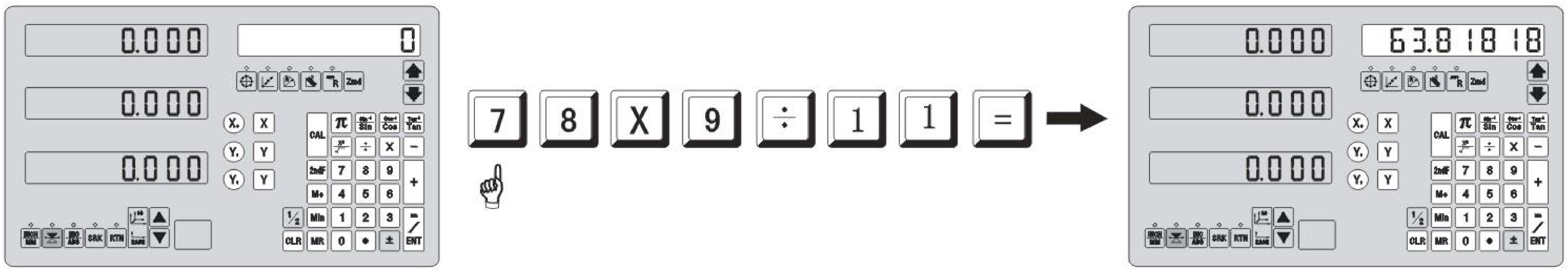


All operations are the same as a general calculator

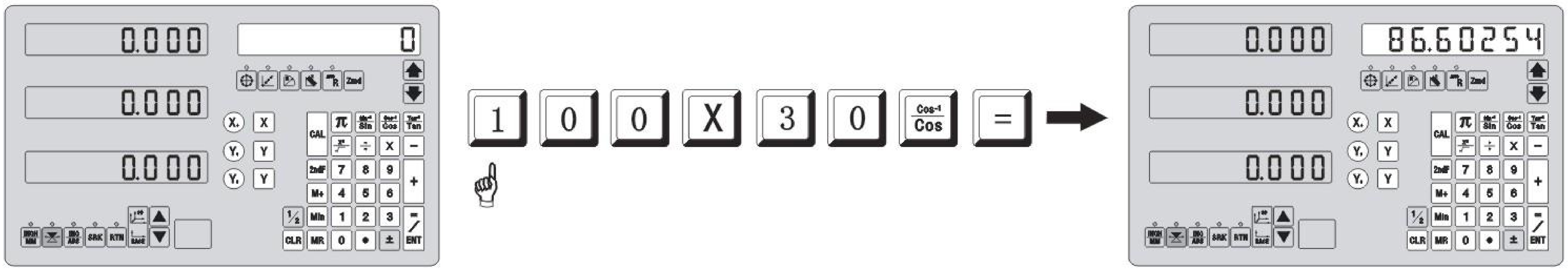
Basic ADD/SUBSTRACT: 78 + 9-11=76



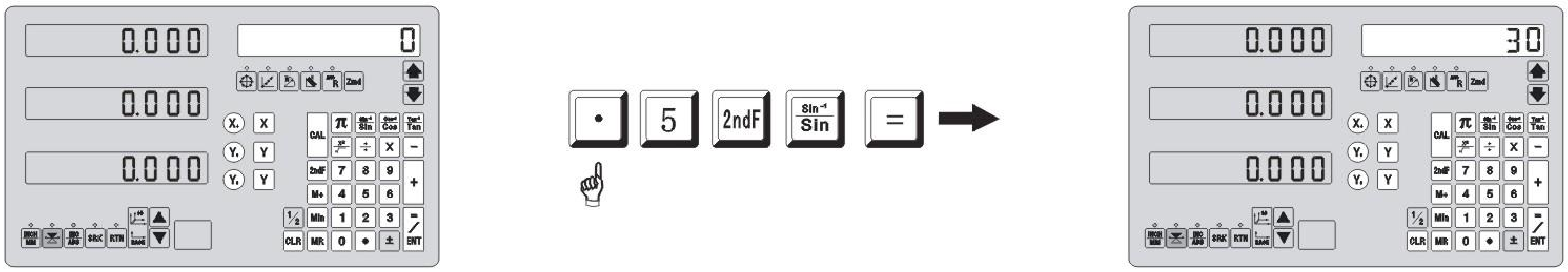
Basic MULTIPLY/DIVISION: 78×9÷ 11=63.81738



Trigonometric function operation: $100\times COS30^{0}=86.6015$



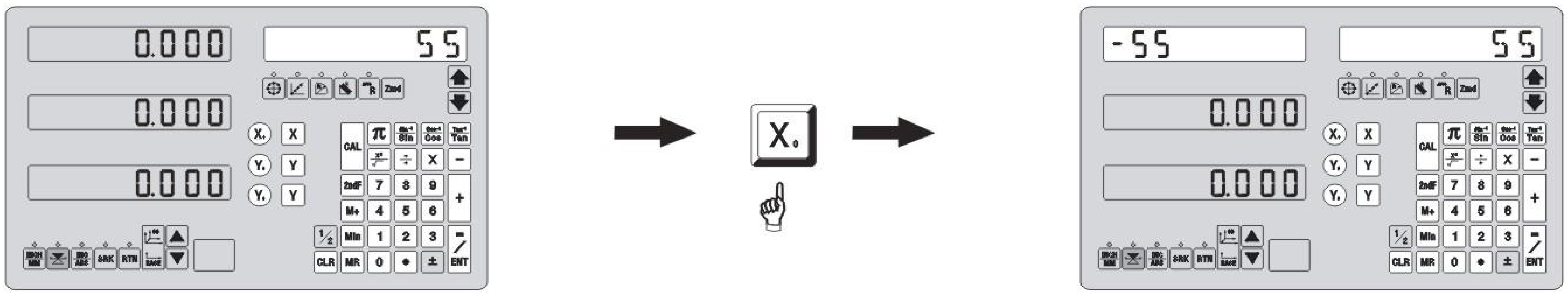
Inverse trigonometric function operation: $SIN^{-3}0.5=30^{0}$



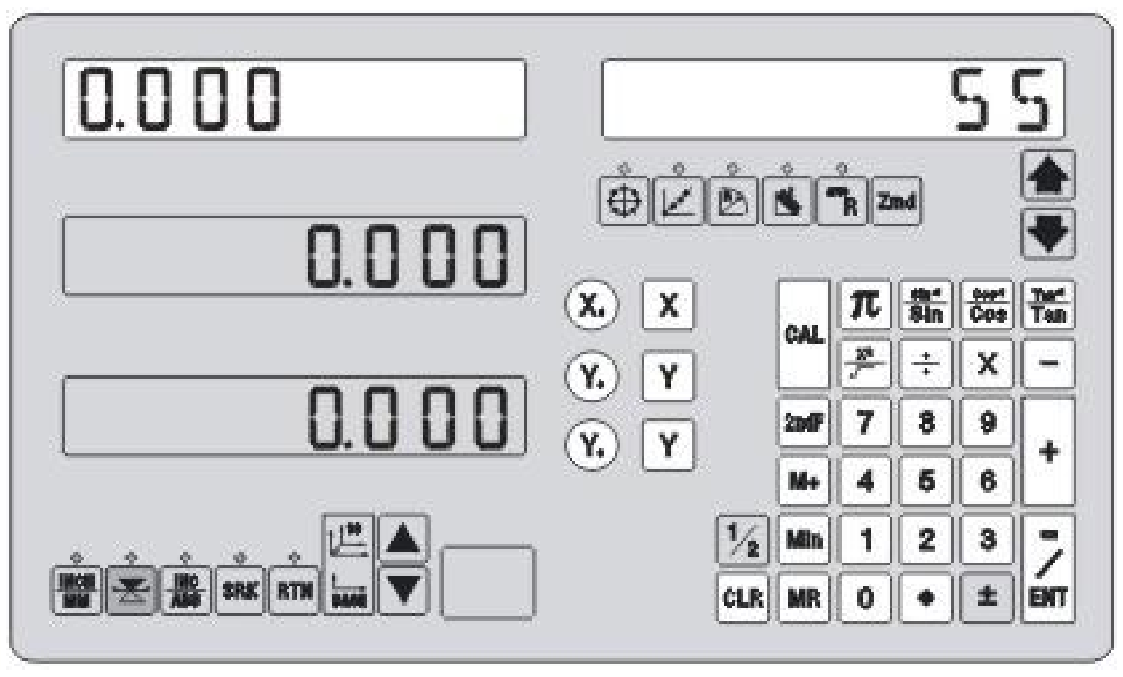
Calculator function

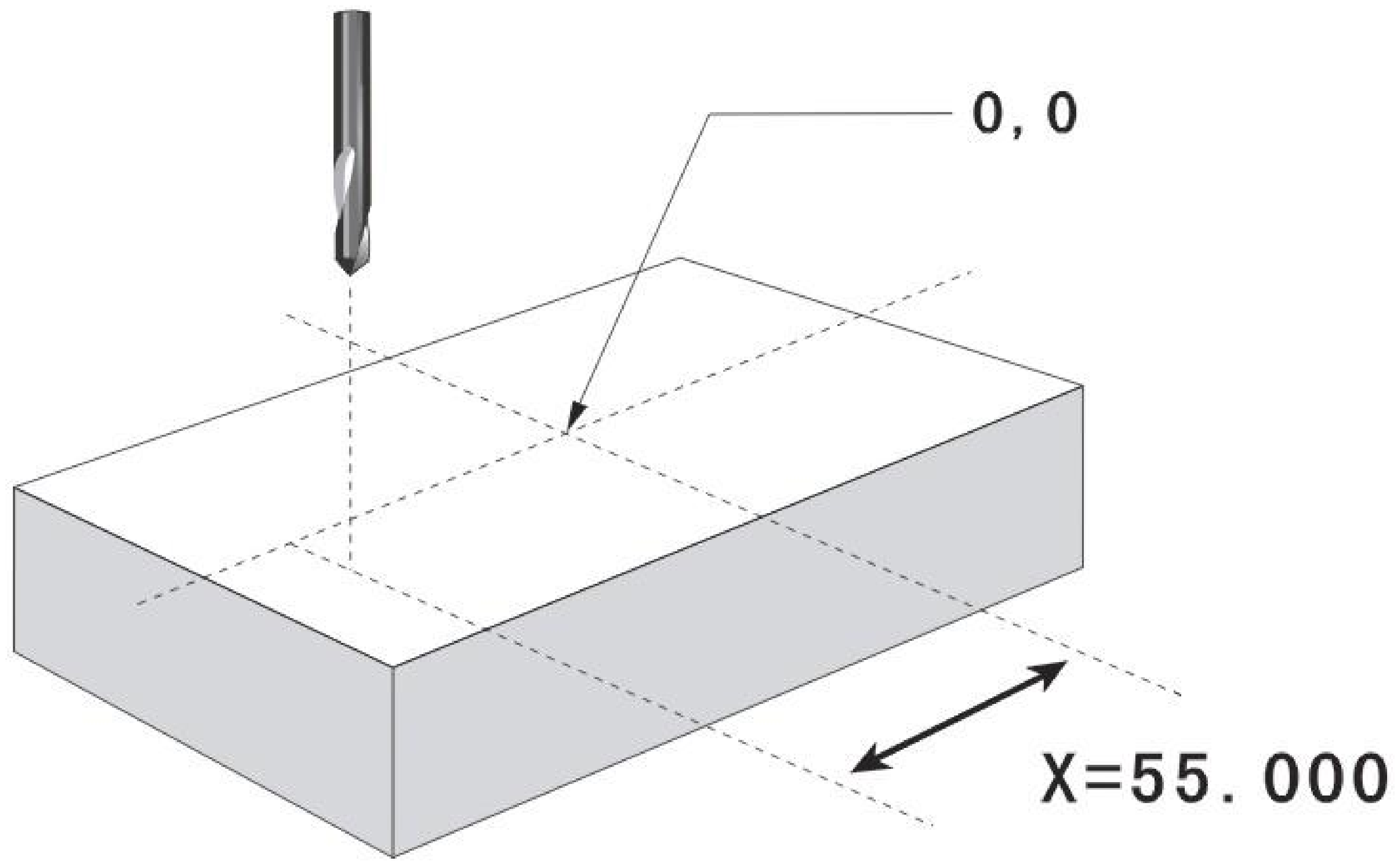
Transfer calculated result to selected axis

Transfer calculated result 55 to axis

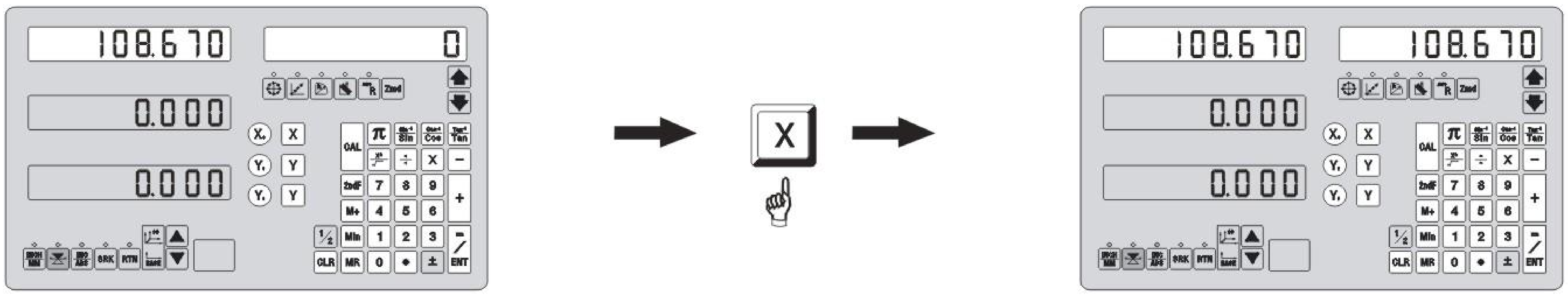


Move X axis until display=0.000, then the calculated position 55 is reached.

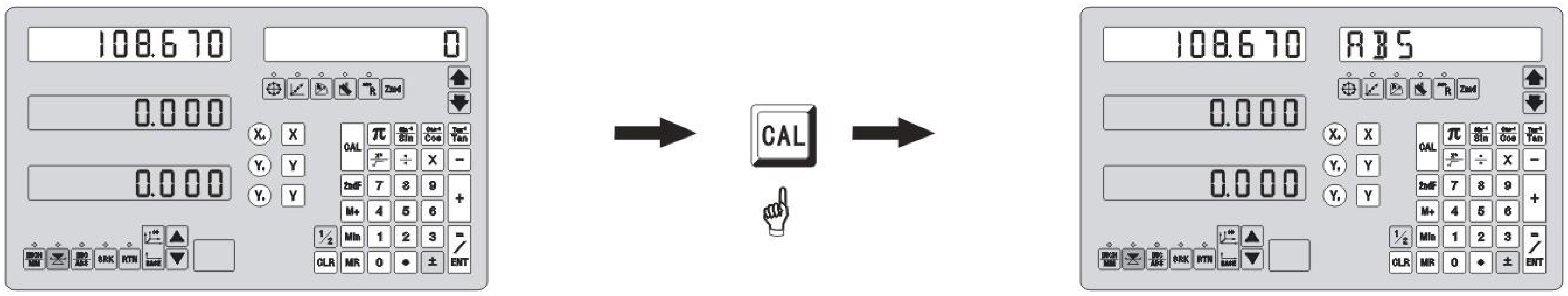




Press X to pick up X axis position as an operator into calculator.



Using key CAL to end calculator function and return to normal mode.

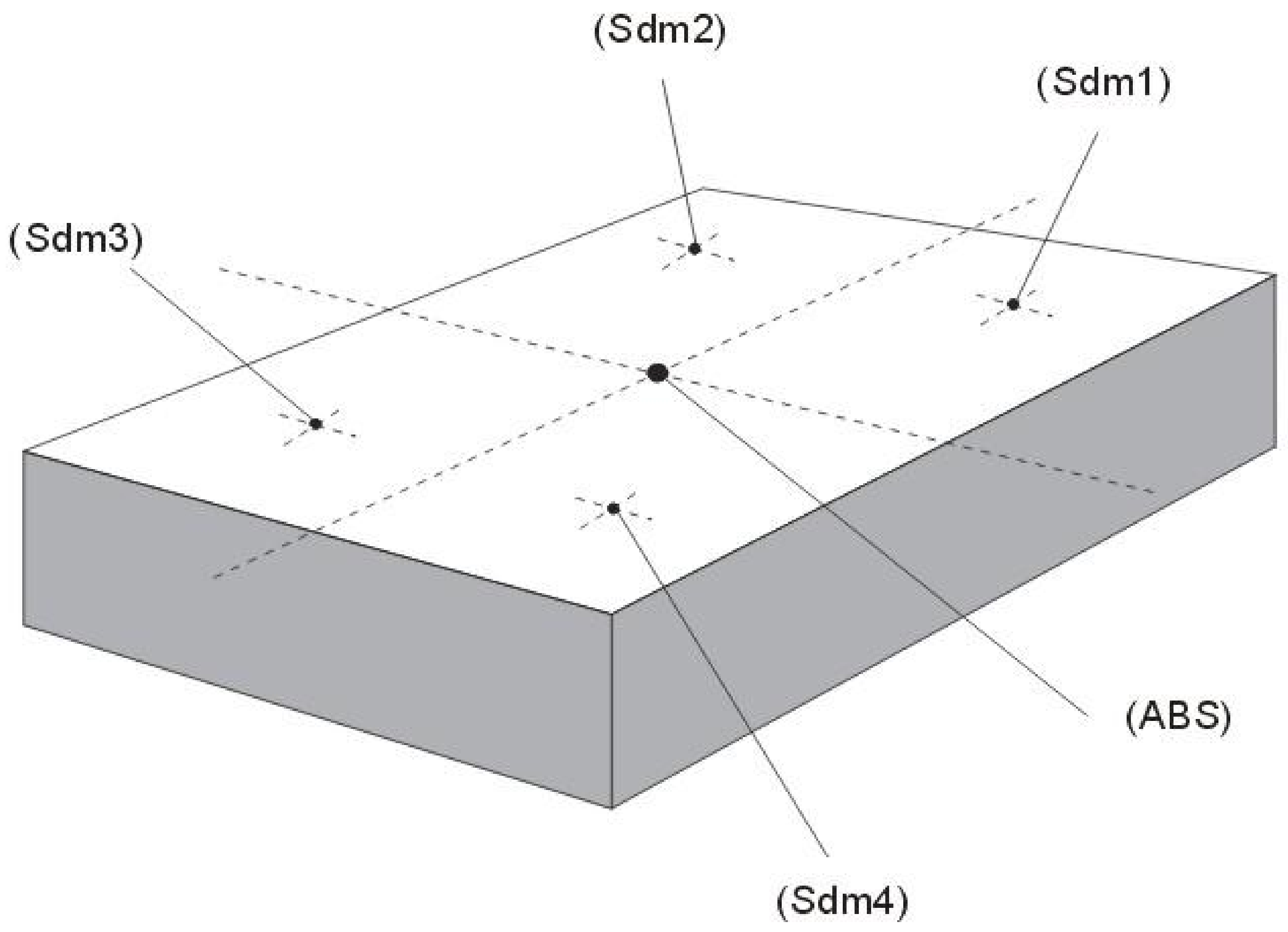


99 sets auxiliary zero position function

Function: digital display provides three coordinates: ABS, INC and 99 sets auxiliary coordinate which can be used as the zero position in the machining process with ABS as absolute coordinate system. As the original datum point, 99 sets auxiliary coordinate is defined relative to ABS.

The digital display has a record window of user coordinate system to record these coordinate point, thus providing convenience for users. When the record window appears '00', the coordinate point shown is the absolute coordinate zero point. When the record window appears ‘01-99', the coordinate shown is user coordinate zero point. Users need only press BASE key to let the record window appear '00', and move the workpiece until '0.000' appears, which is the basic zero position of the workpiece..

Attention: under ABS coordinate and except setting basic zero position, users should not clear the coordinate to zero. Otherwise, basic zero position will change.



99 sets auxiliary coordinate (SDM coordinates)

● Useful in case of batch machining of repeat work and workpiece machining has more than two coordinates.

● Based on ABS zero point, setting and storing all referential zero point.

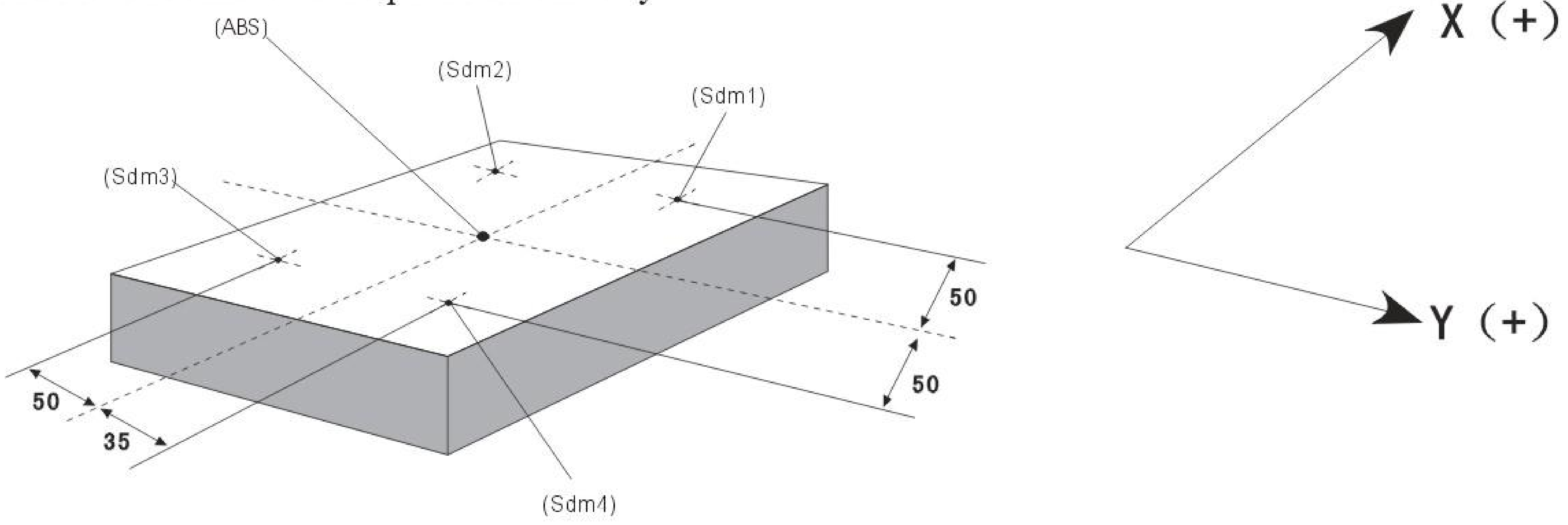
● Press ▲ or ▼ coordinate selection key to select xx coordinate zero point, move machine tool until '0.000' which is the zero point appears.

Example:

if 4 sets SDM coordinates (SDM1-SDM4) are needed on the workpiece, two methods can be used.

1.Set to zero after one SDM coordinate zero reached.

2.Set dimensions of SDM coordinates zero position directly.

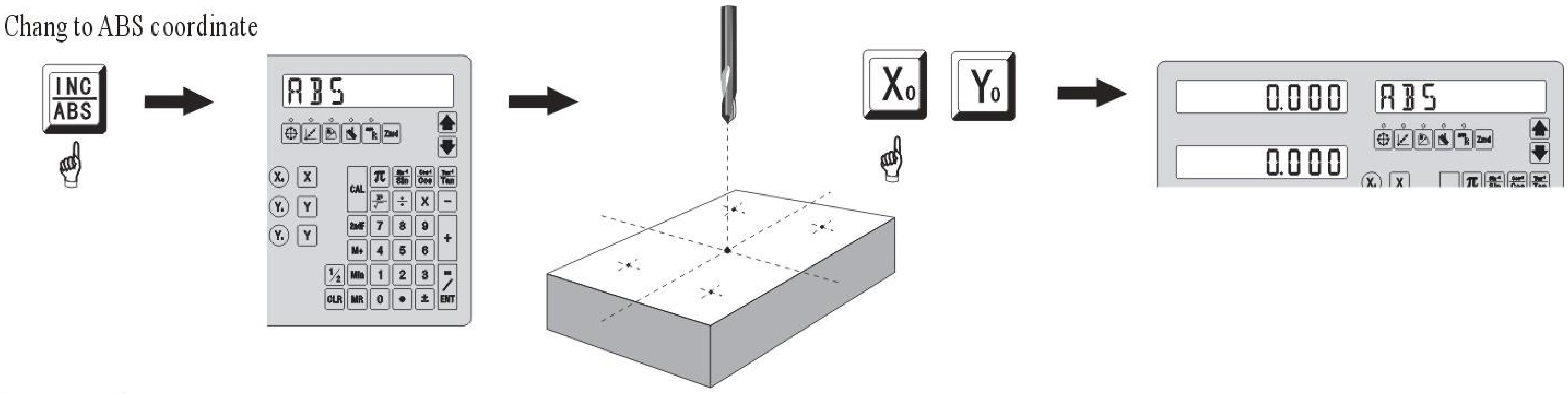


99 sets auxiliary zero position function

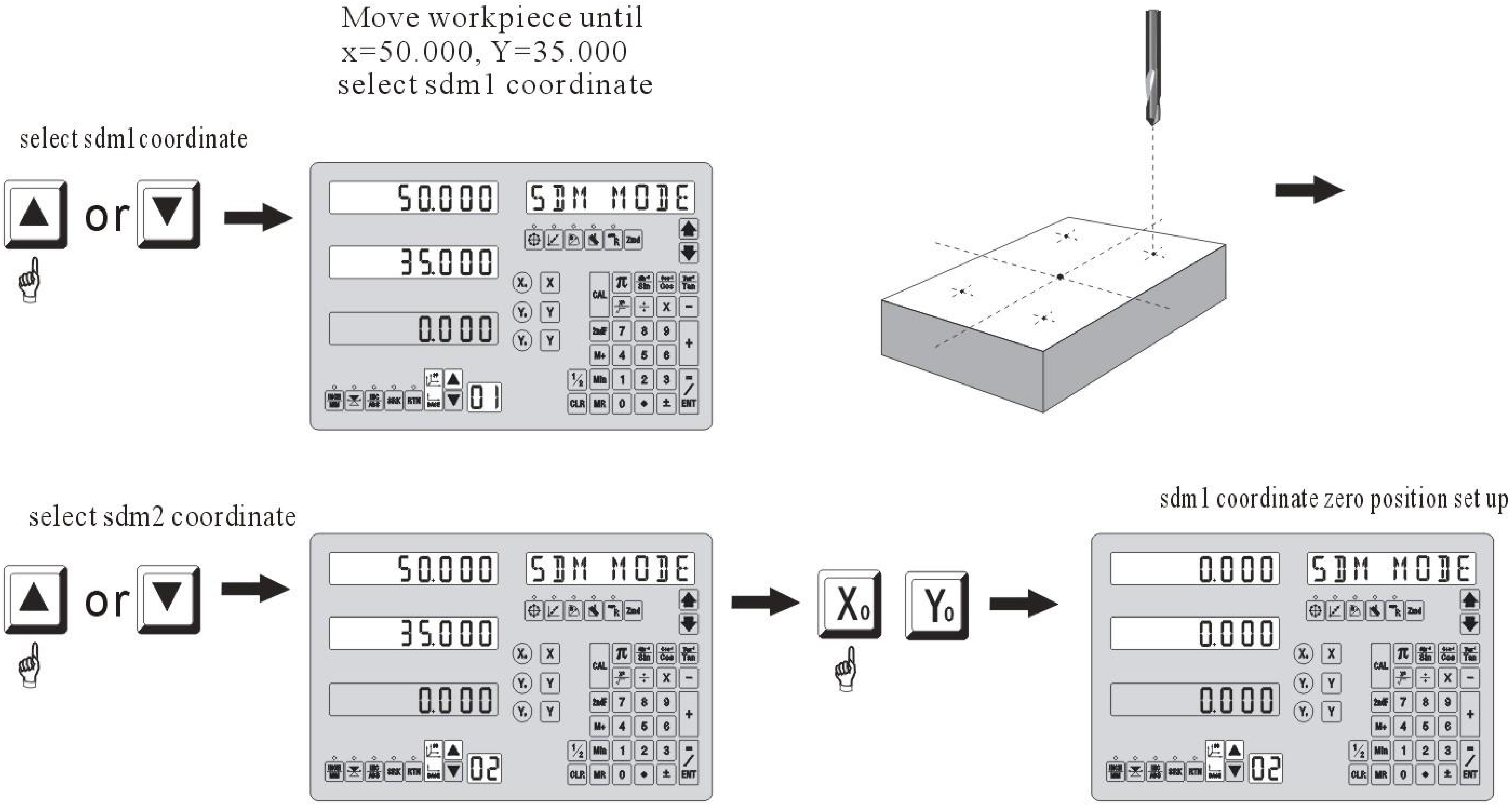
Method 1:

Clear display to zero when SDM coordinate zero position is reached. Under ABS coordinate, set basic zero position of workpiece and move workpiece to each auxiliary zero position,then press $\boxed{X}$ and $\boxed{Y}$, thus memorizing zero position.

Step 1: Set workpiece ABS zero position.


Chang to ABS coordinate

Step 2: the first point (SDM1)

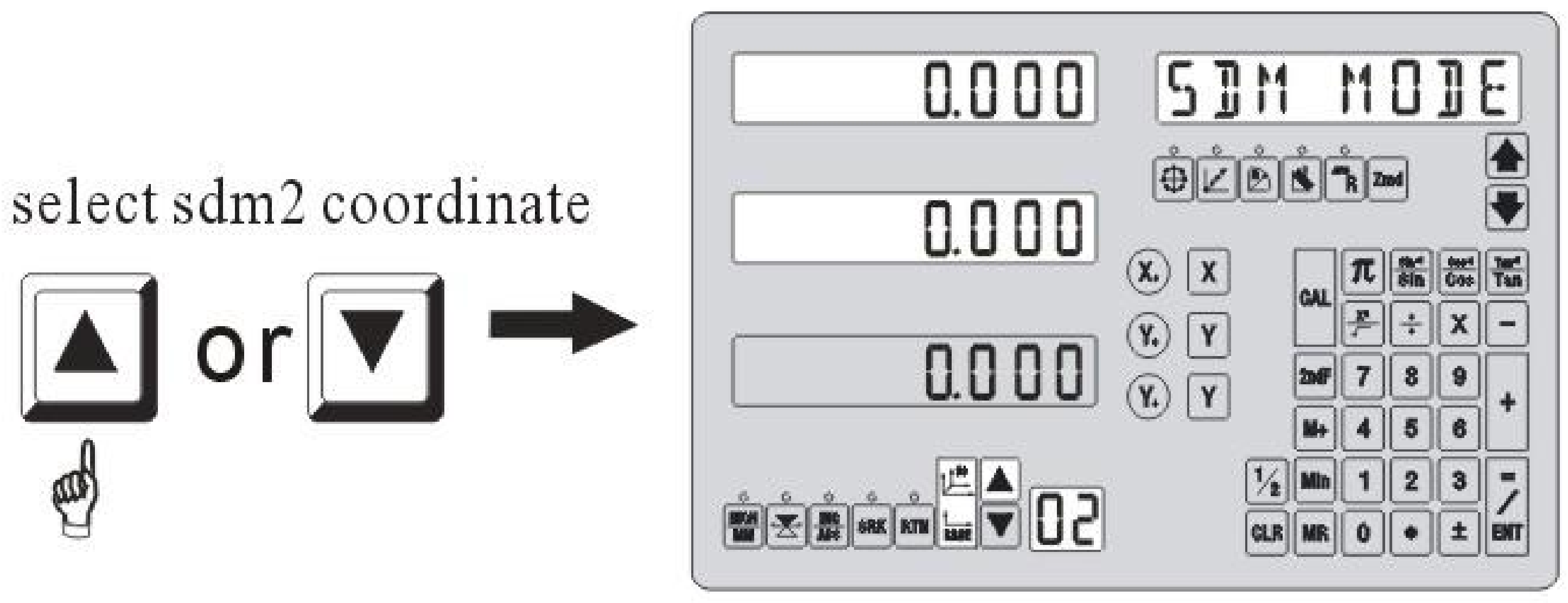

Move workpiece until x=50.000, Y=35.000 select sdm1 coordinate

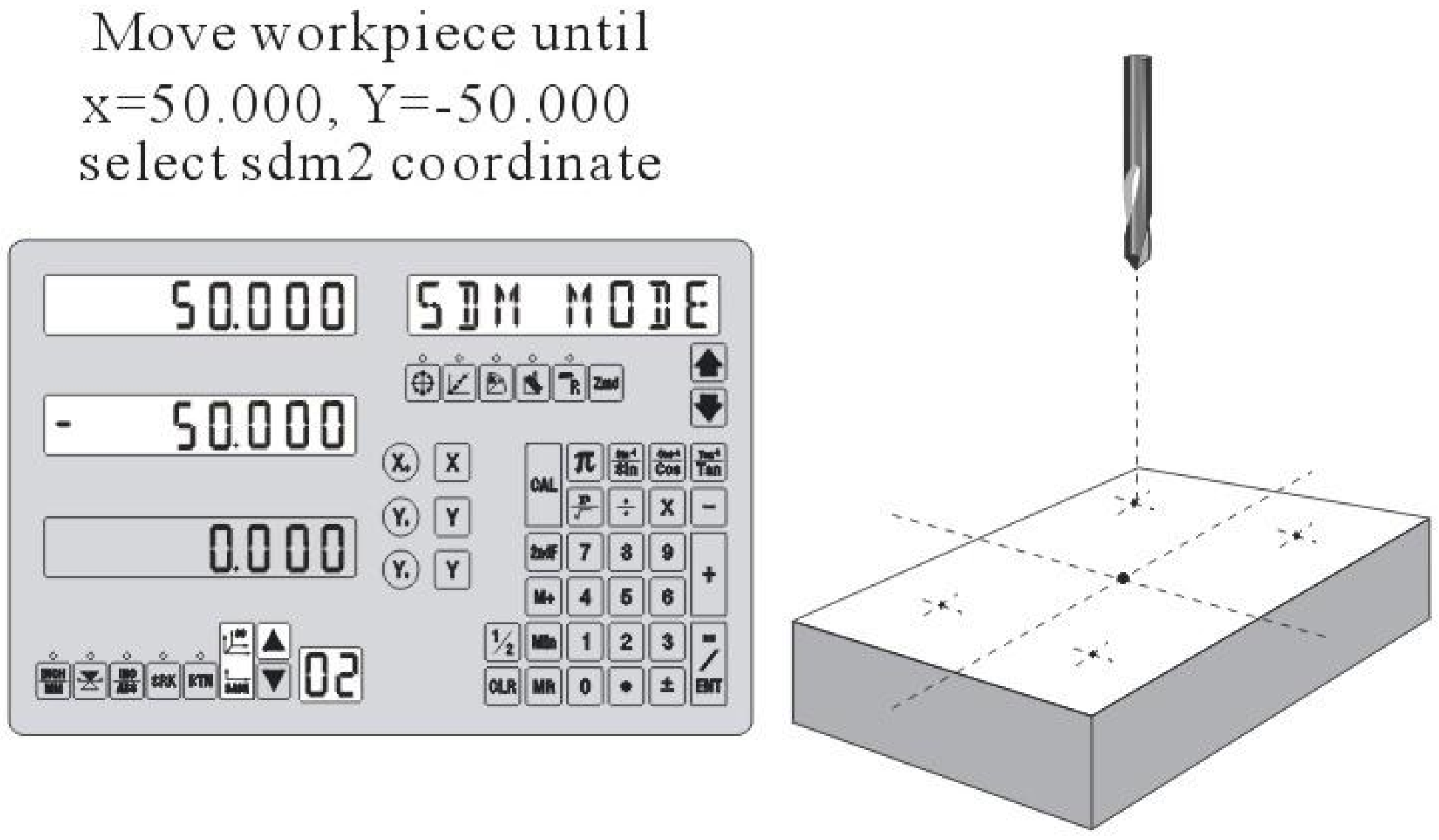
select sdm1 coordinate

select sdm2 coordinate

sdm1 coordinate zero position set up

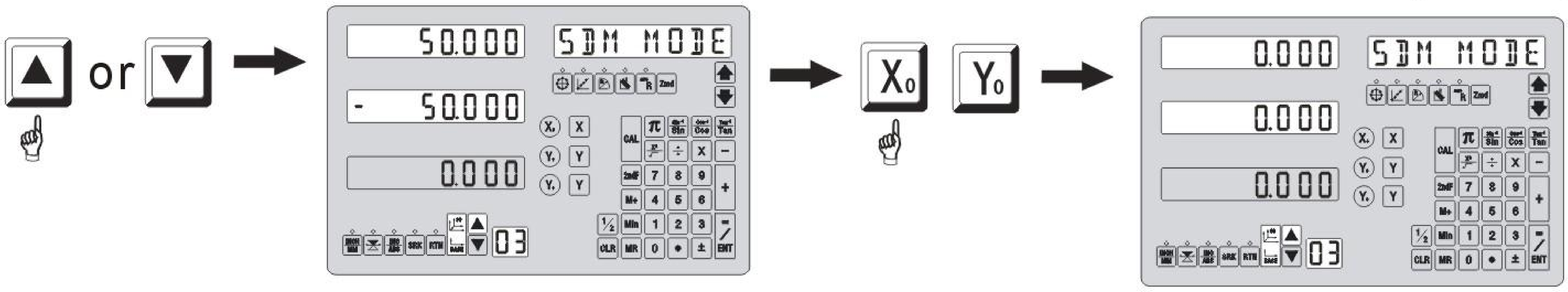
Step 3: the second point (SDM2)


select sdm2 coordinate


Move workpiece until x=50.000, Y=-50.000 select sdm2 coordinate

99 sets auxiliary zero position function

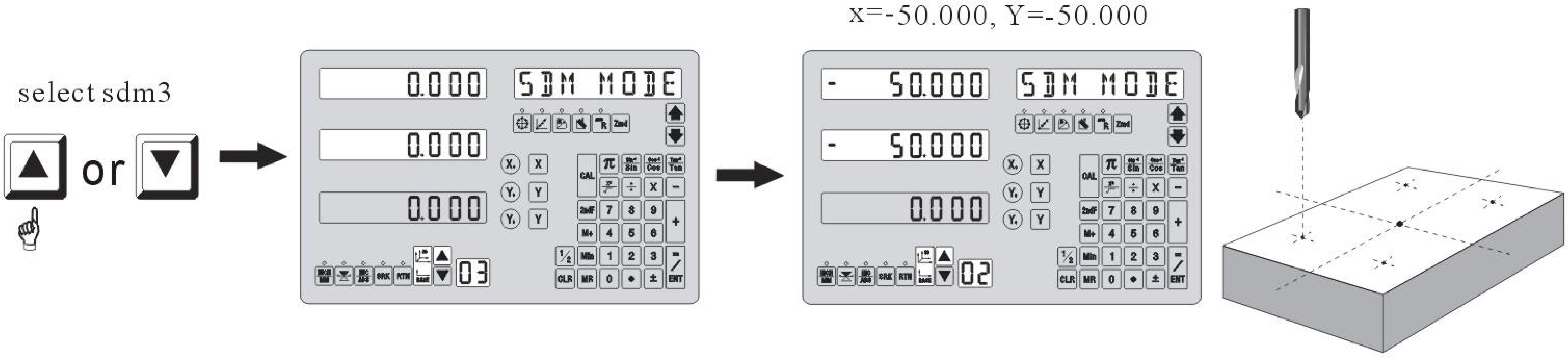
select sdm3



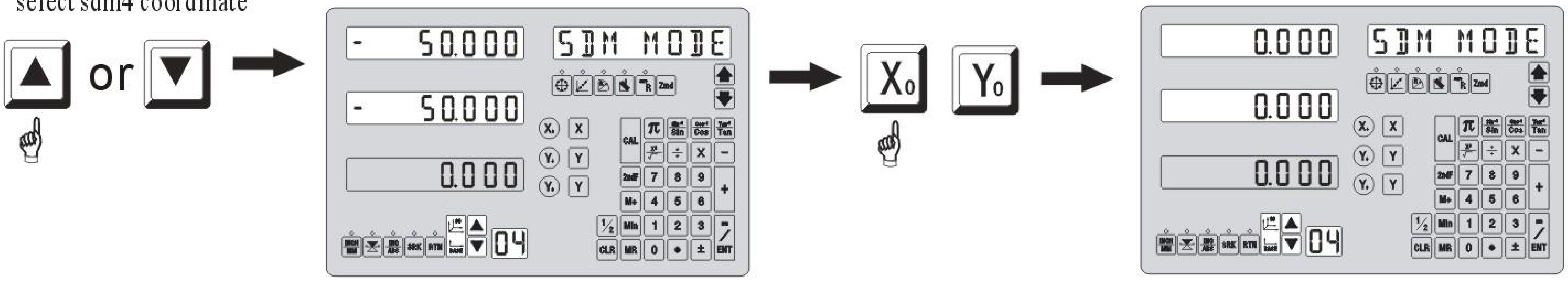
sdm2 coordinate zero position set up

Step 4: The third point (SDM3)

Move workpiece until
x=-50.000, Y=-50.000


select sdm3

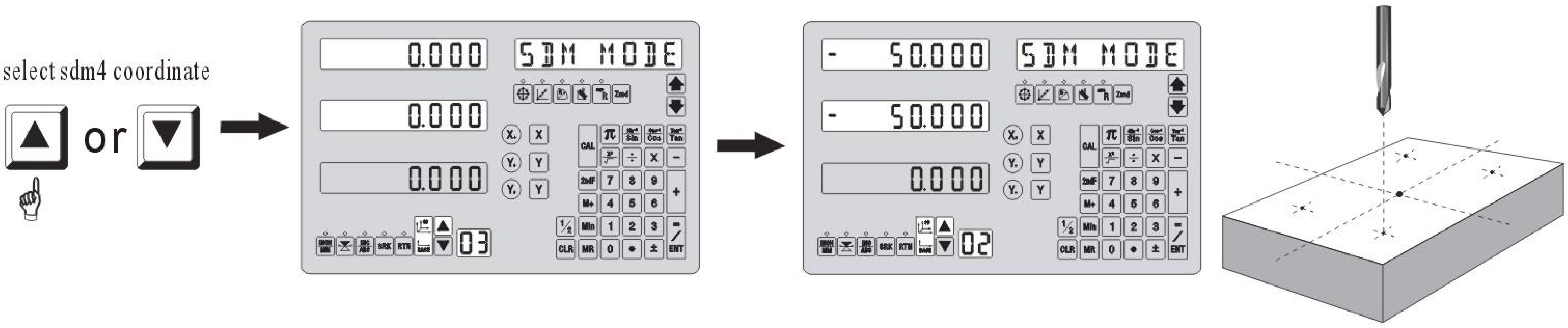
select sdm4 coordinate



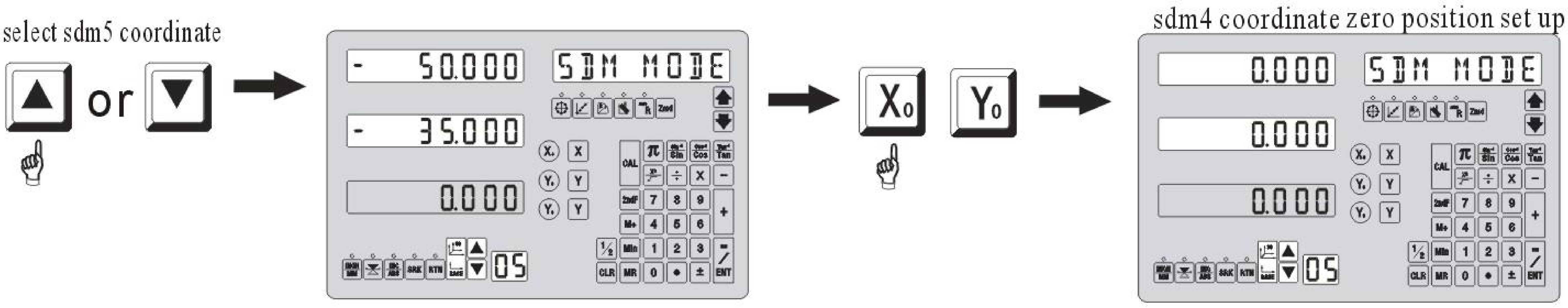
sdm3 coordinate zero position setup

Step 5 the fourth point (SDM4)

Move workpiece until
x=- 50.000, Y=-35.000


select sdm4 coordinate

select sdm5 coordinate



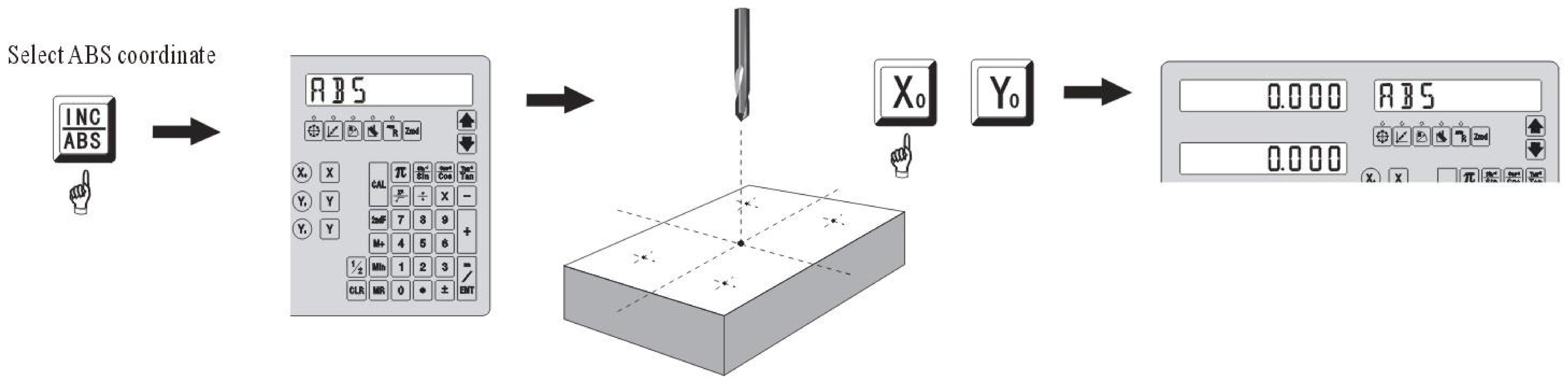
sdm4 coordinate zero position set up

99 sets auxiliary zero position function

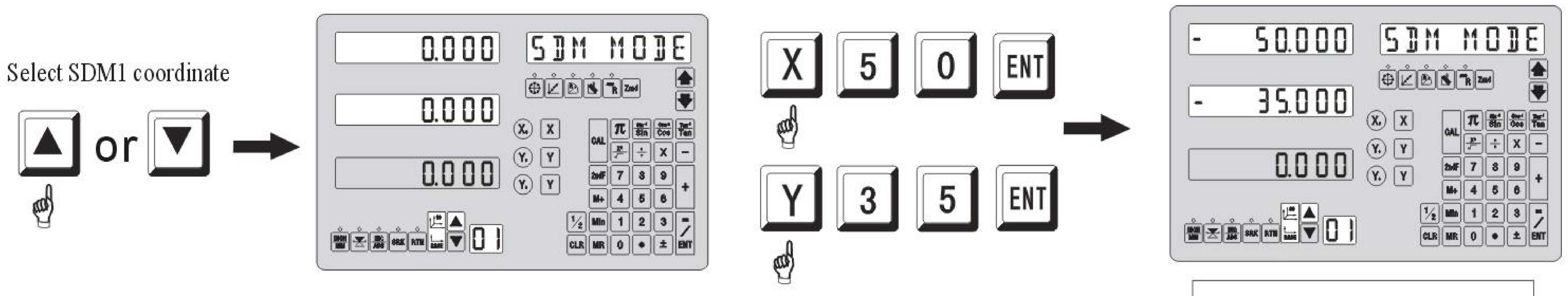
Method 2: Press SDM coordinate zero position

Function: SDM keyboard input method moves workpiece to ABS zero position directly after workpiece basic zero position of ABS coordinate is set up, then all the SDM zero coordinate is input by keyboard.

Step 1 set workpiece ABS zero position

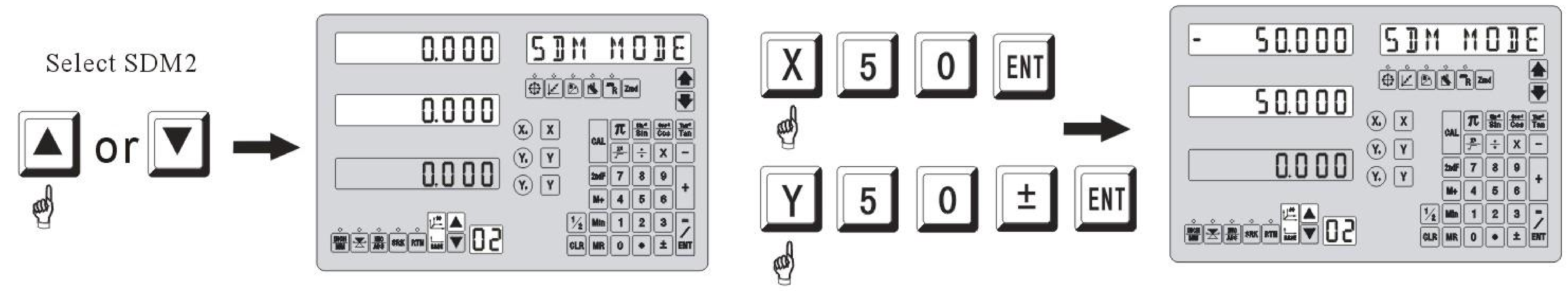


Step 2 Set the first point (SDM)



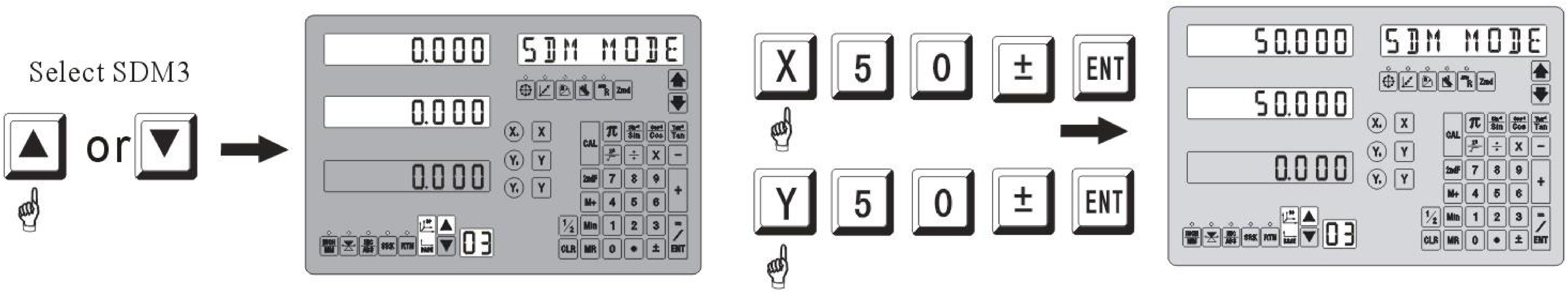
Attention:
when input SDM zero position, the coordinate shown is opposite to the input coordinate, which is normal and correct. The reason is that the machine tool is in the ABS zero position. The display is relative to SDM zero position, so the coordinate shown is positive-negative opposition.

Step 3: Set the second position

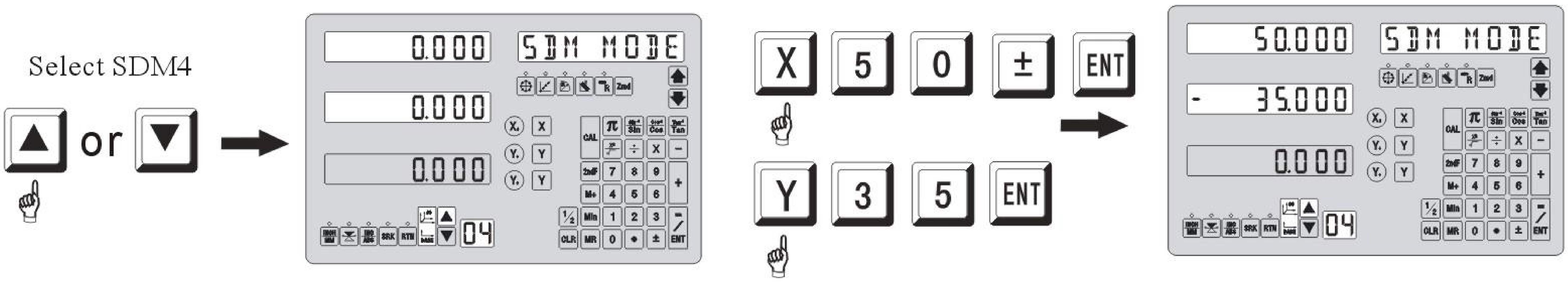


99 sets auxiliary zero position function

Step 4: Set the third position



Step 5: set the fourth position

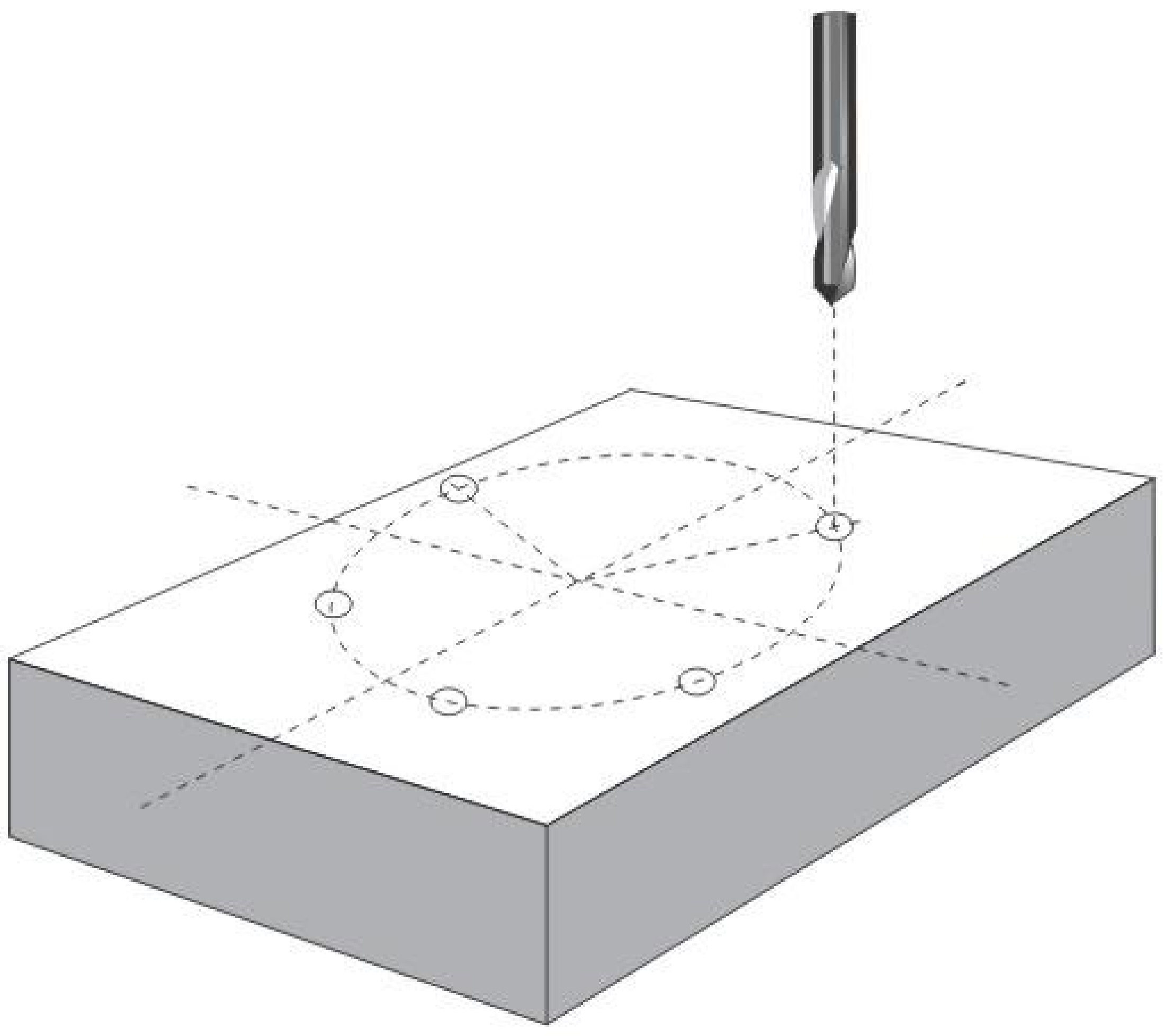


After preset all SDM coordinate zero position, user can use ▲ or ▼ key to select them.

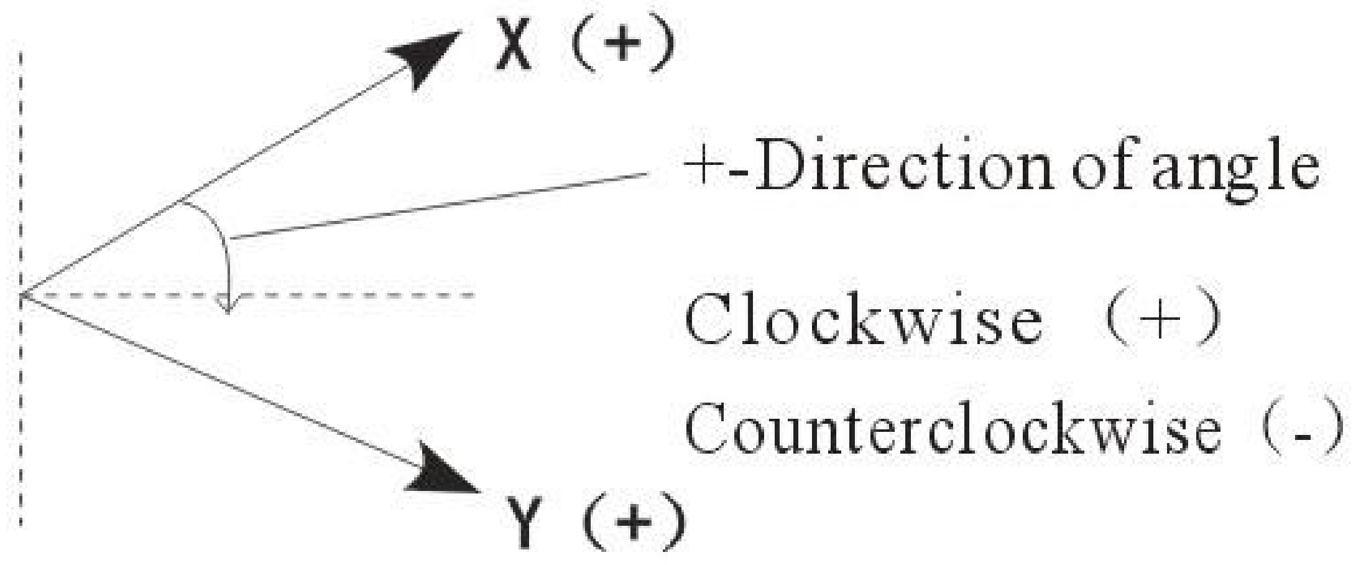
Pitch circle diameter (PCD) function

Function: digital display provides convenient PCD function
Users need only enter the following:

- Center of the circle (CENTER)
- Diameter (DIA)
- Number of Holes (NO. HOLE)
- Start Angle (ST. ANG)
- End Angle (END. ANG)



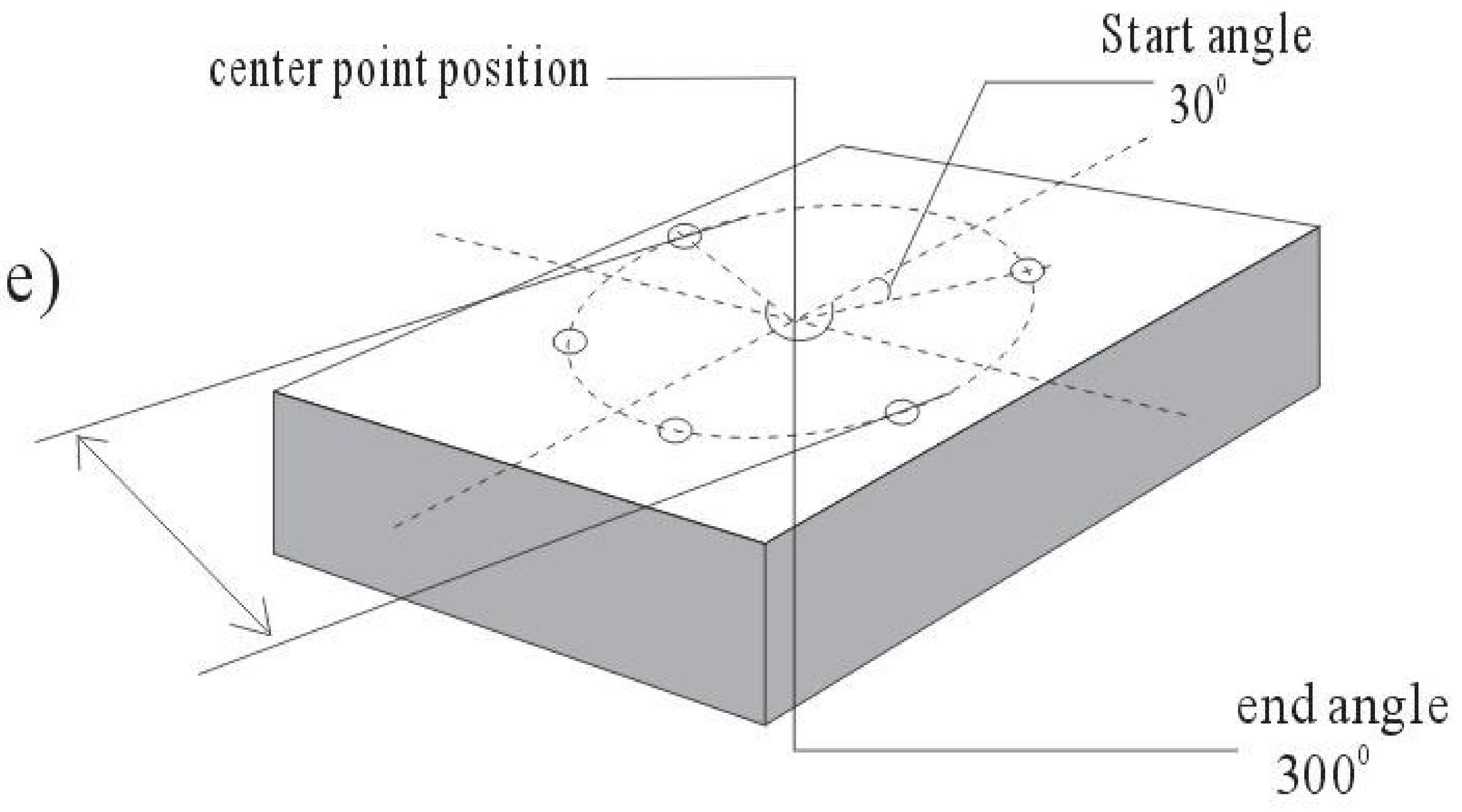
After the above parameters enter into display, it will calculate and preset all divided holes (number of holes) on the circle. Users can move ⬆ or ⬇ key to select one of the holes and move the workpiece until display=0.000. This hole's cutting position is locked.



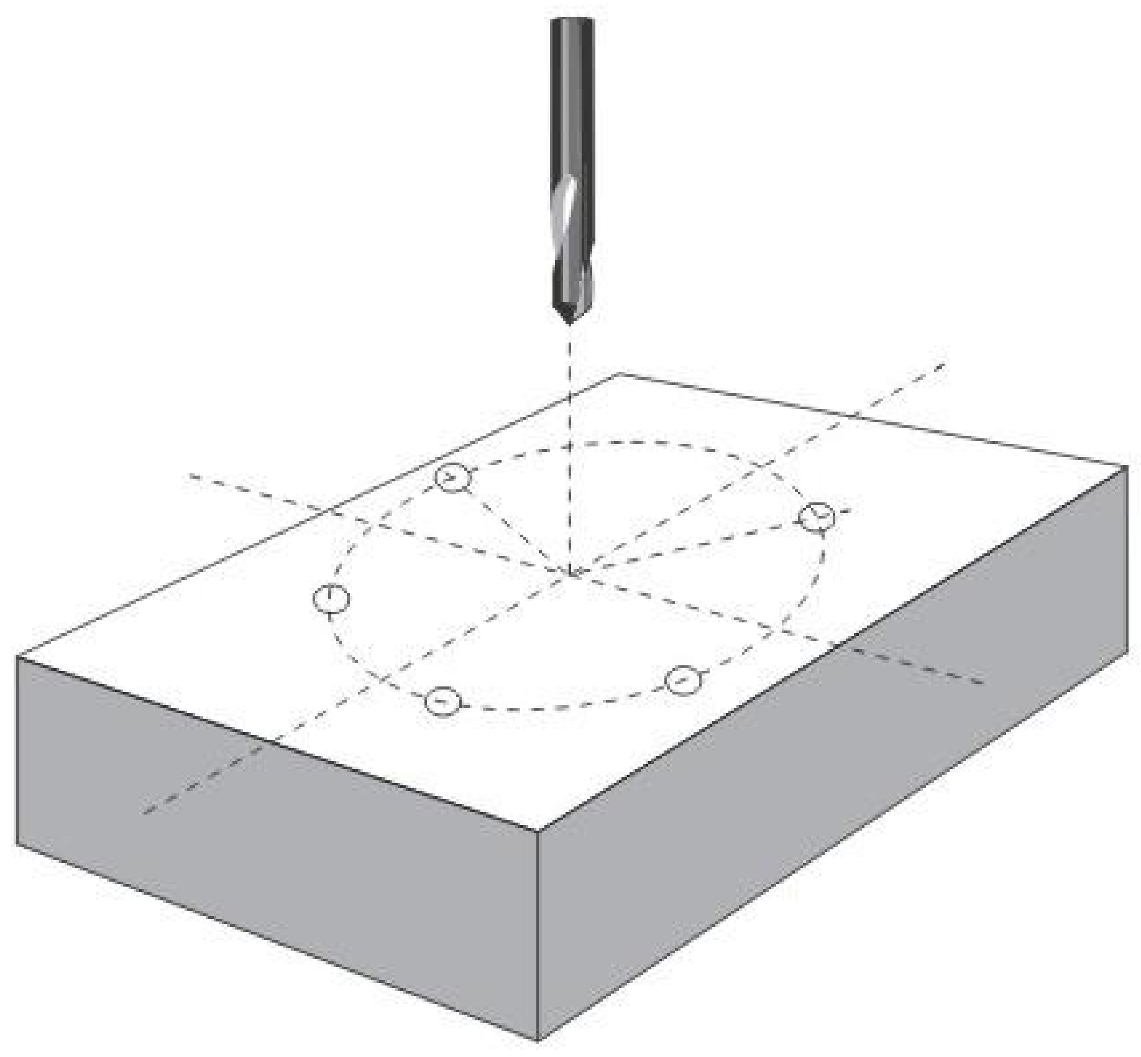
Example:

Center Coordinate (Center)……X=0.000, Y=0.000
Diameter (DIA)…………80.000mm
Number of Holes (NO. HOLE)…………5
Start Angle (ST. ANG)…………30 degree (clock wise)
End Angle (END. ANG)…………300 degree (clock wise)

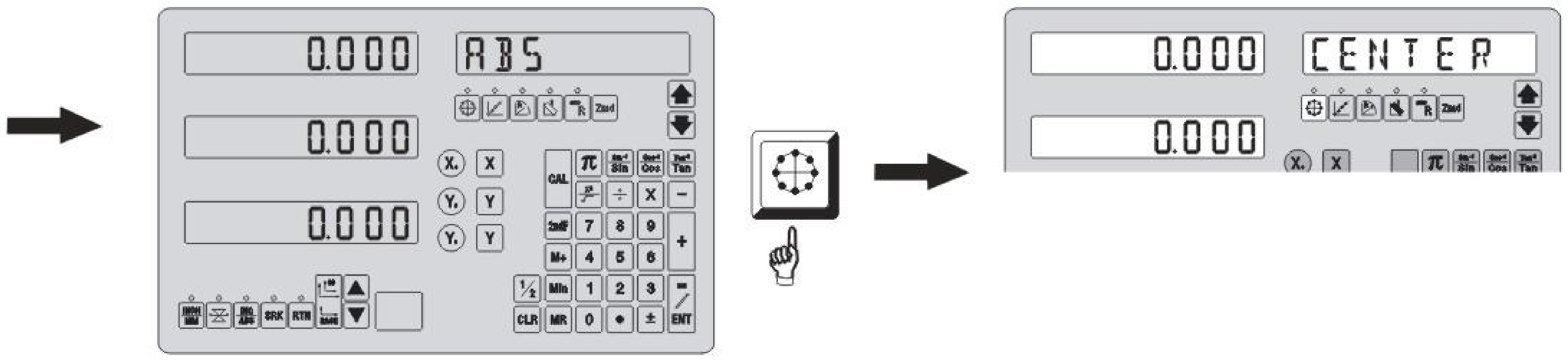
Attention: the above example is to share holes on an arc. If sharing holes takes on a circle, the start angle is 0 degree and the end angle is 360 degree.



Step 1: set workpiece zero position and press ⊕ to enter PCD function.



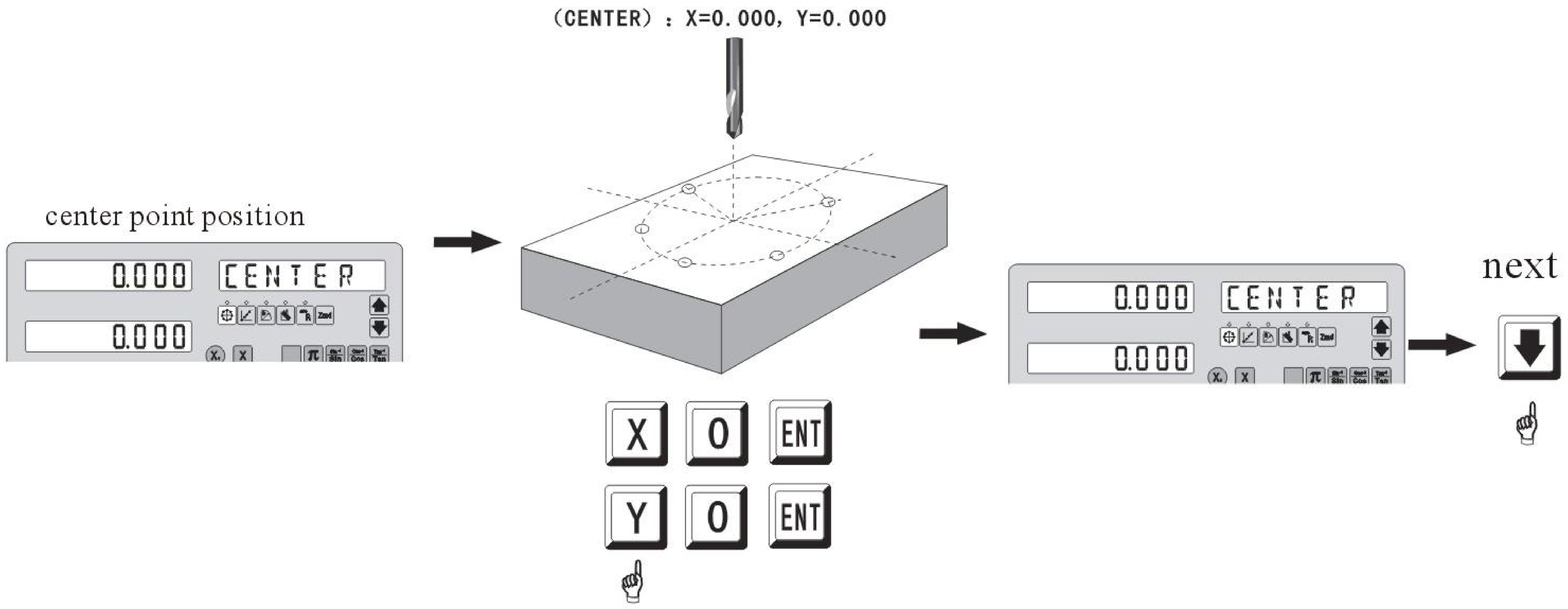
set zero position of workpiece



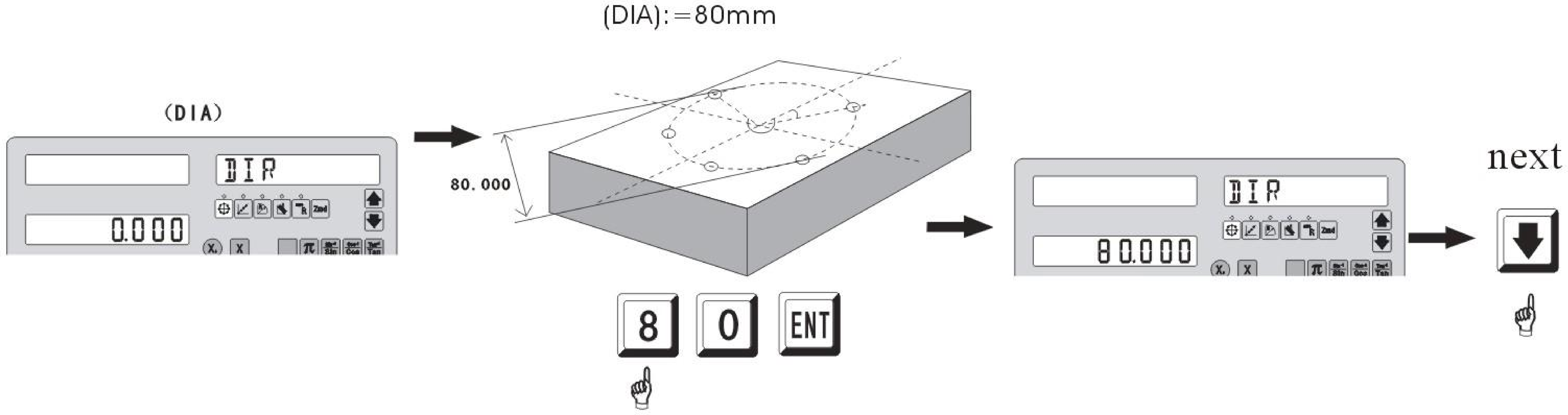
press function key to enter PCD function

Pitch circle diameter (PCD) function

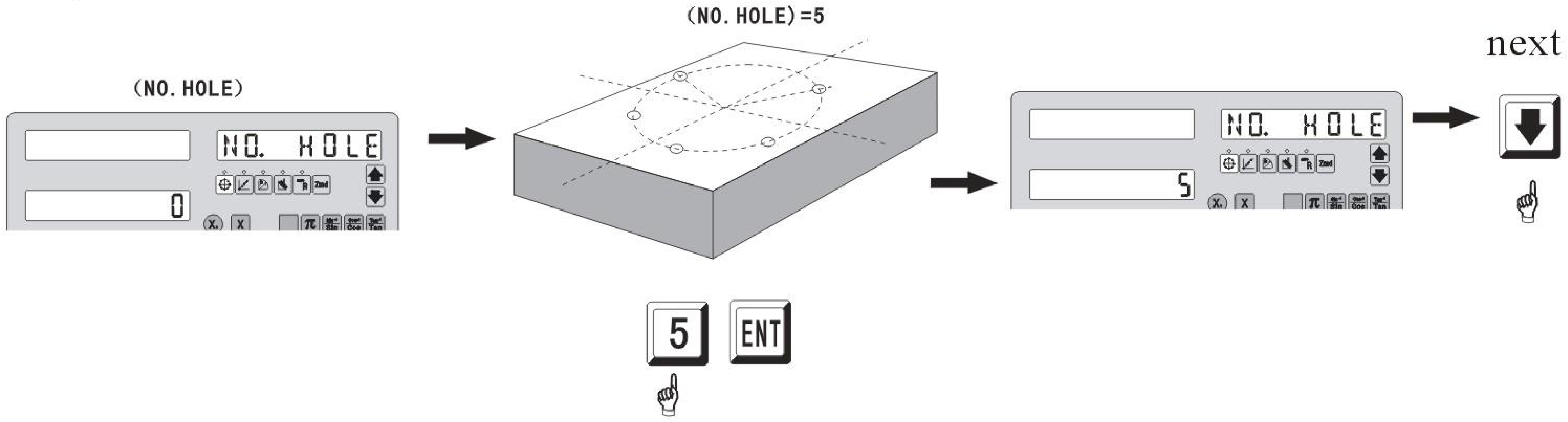
Step 2： enter center position



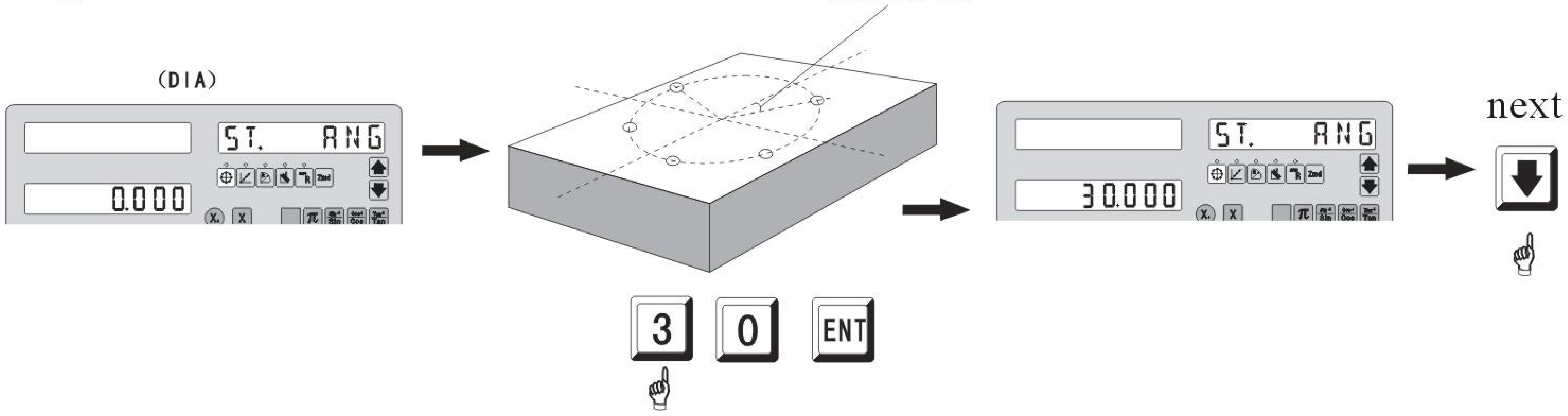
Step 3: enter diameter



Step 4: enter number of holes

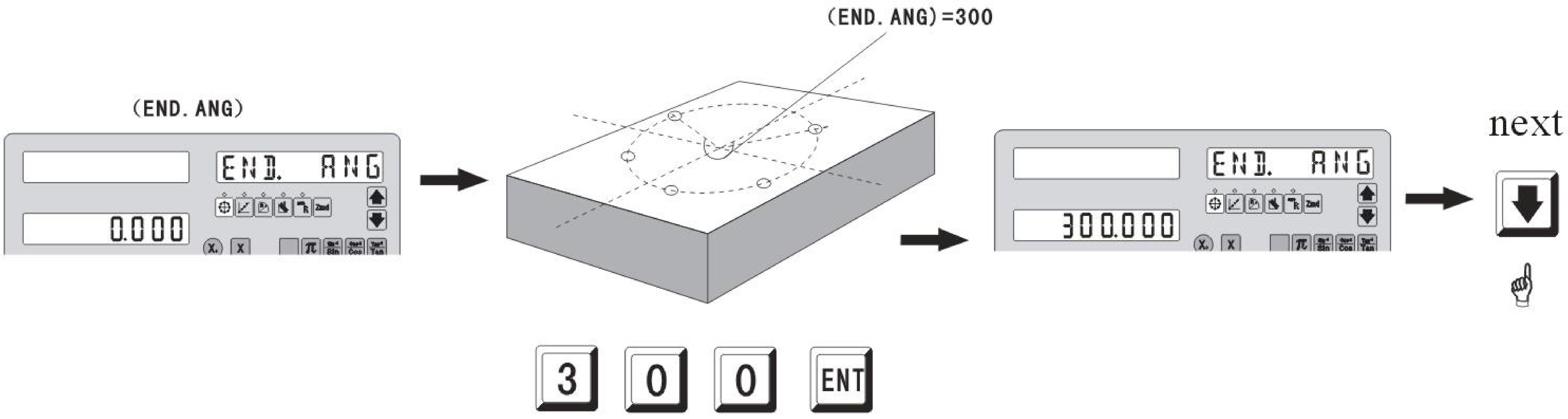


Step 5: enter start angle

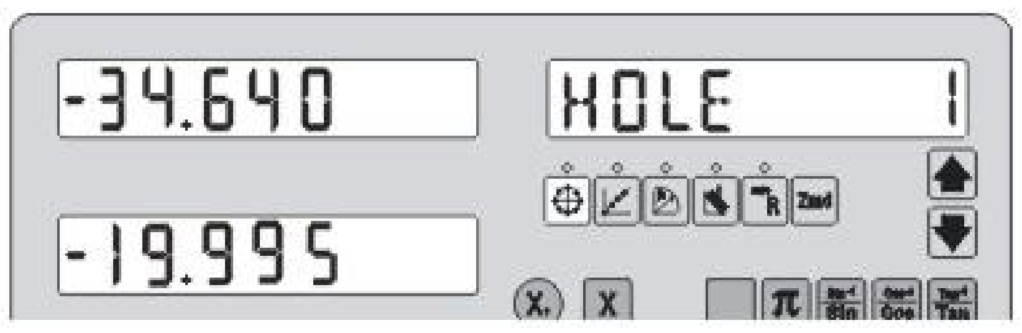


Pitch circle diameter (PCD) function

Step 6: enter end angle (END.ANG)=300

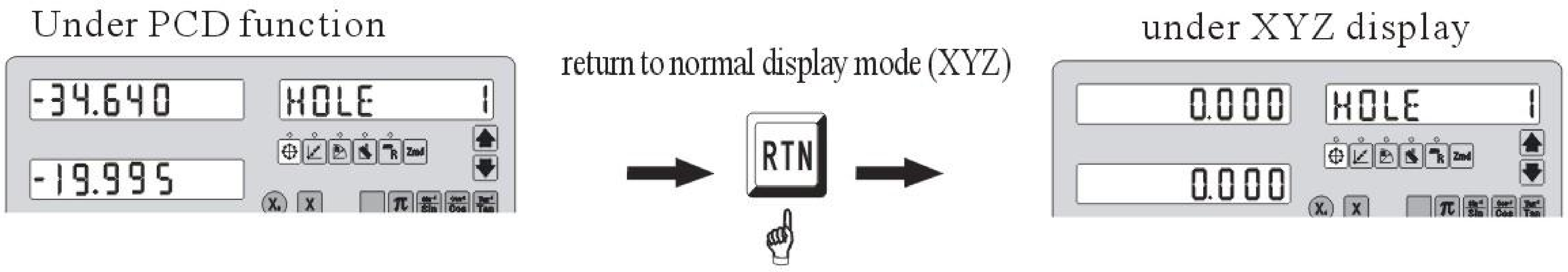


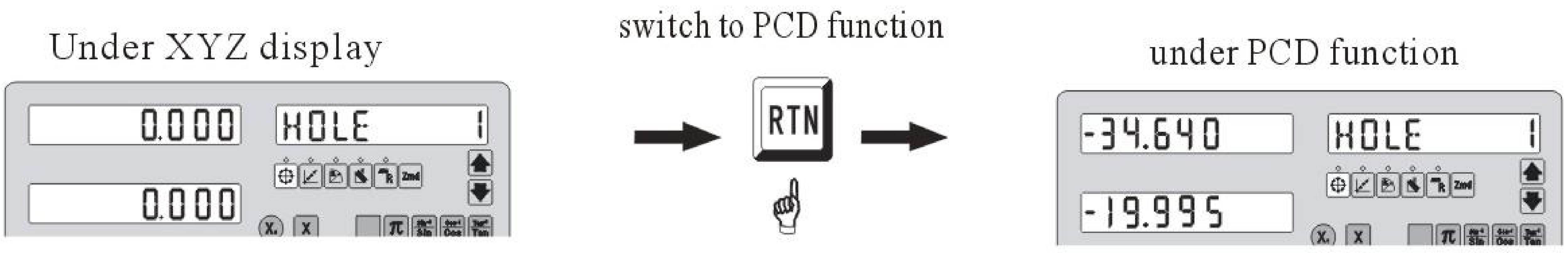
After enter all the parameters on of PCD,
press ⬇ key to enter into machining mode.



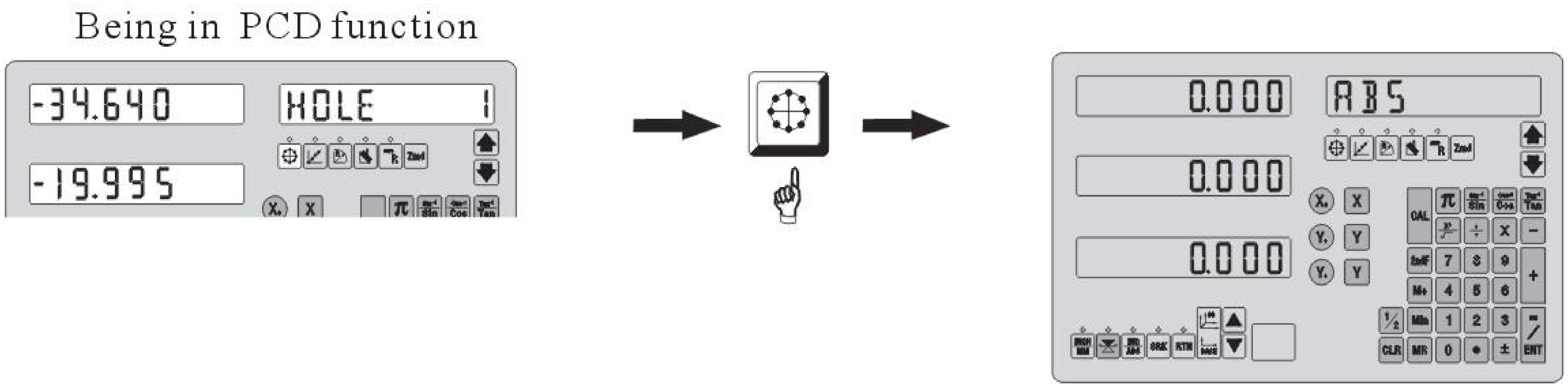
Using ⬆ or ⬇ to select one of the holes. Move the workpiece until axes display to 0.000 to get the position of the circle diameter holes.

User can return to normal mode (XYZ) and temporarily exit PCD mode to check the calculated position at any time.





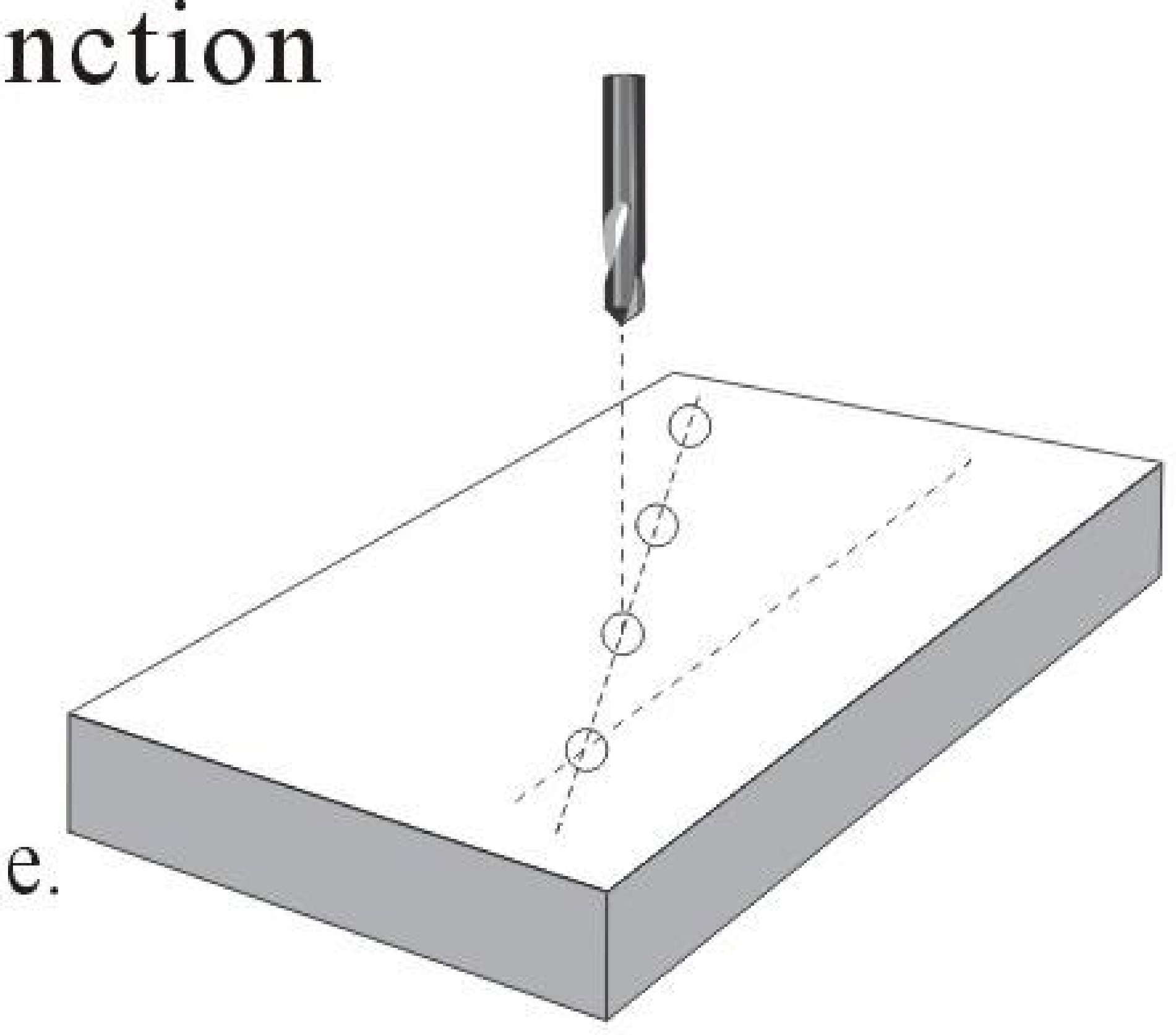
Finish PCD function and return to normal mode



Sharing holes on the line (SHL) function

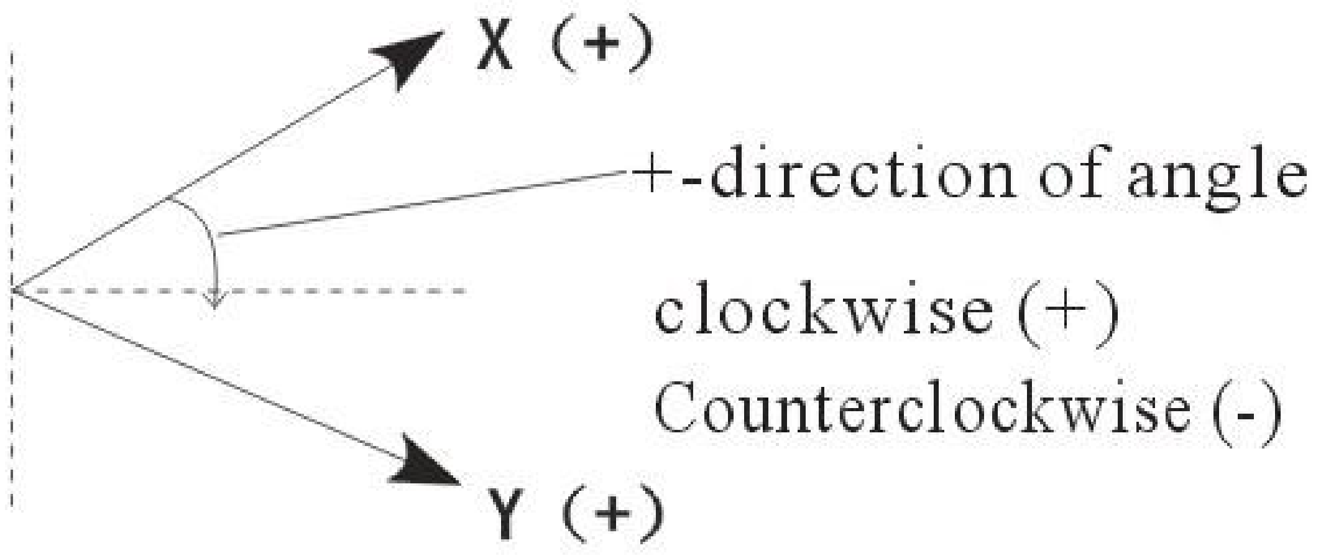
Function: digital display provides convenient SHL function
Users need only enter the following:

- Length of the line (LIN DIST)
- Angle of the line (LIN ANG)
- Number of holes (NO. HOLE)



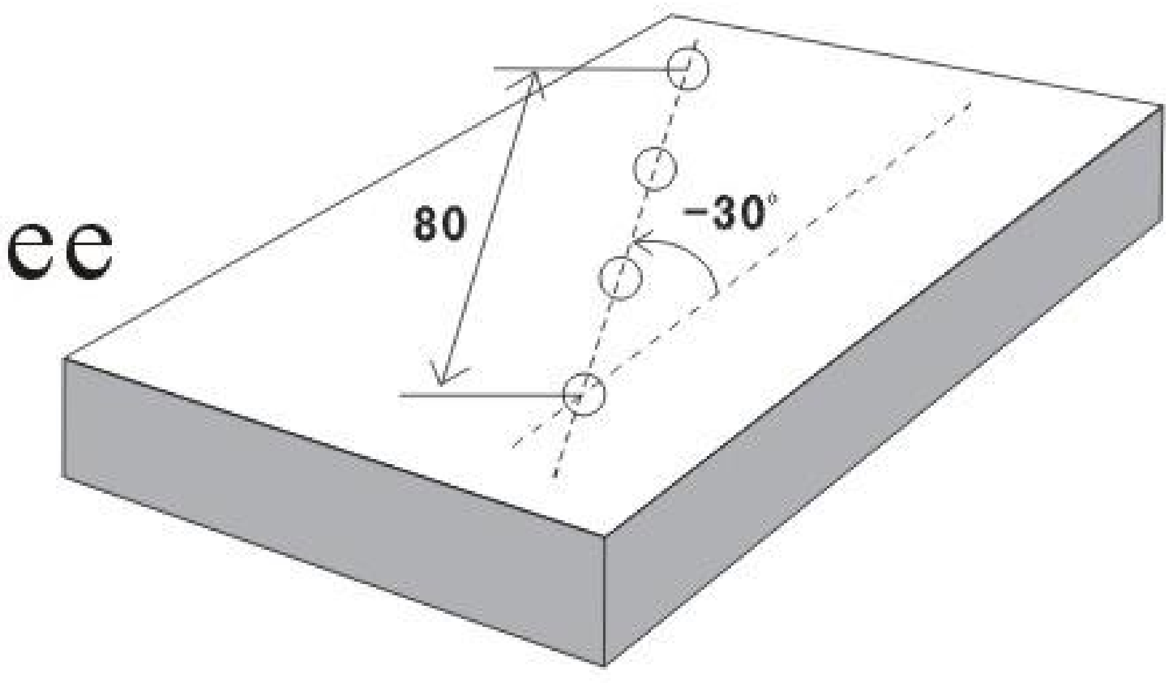
After all the parameters, digital will calculate the position of holes on the line.

Users need only press ↑ or ↓ key to select one of the holes.Move the workpiece until axes display to 0.000, which is the position of the hole.

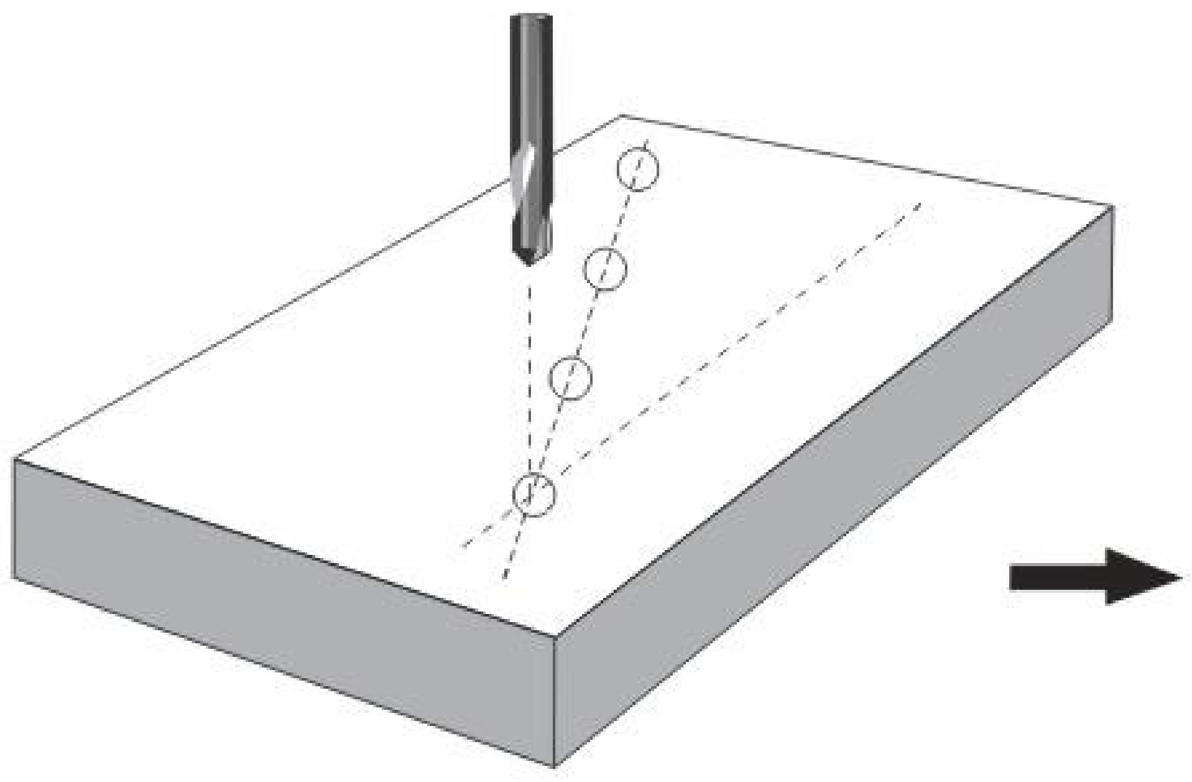


Example:

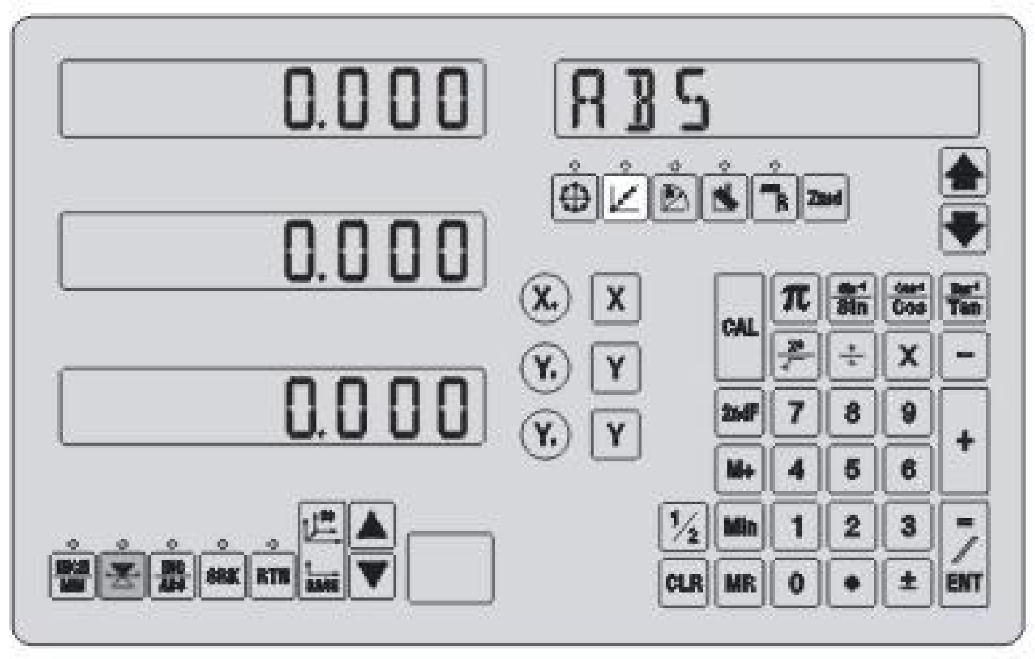
Length of the line (LIN DIST)……80mm
Angle of the line (LIN ANG)……-30 degree
Number of holes (NO. HOLE) ……4



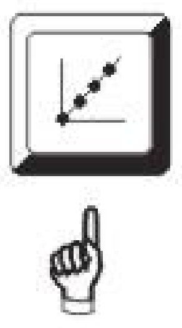
Step 1: Move the workpiece until cutting hole posits to the first hole position,then press ↗ to enter SHL function.

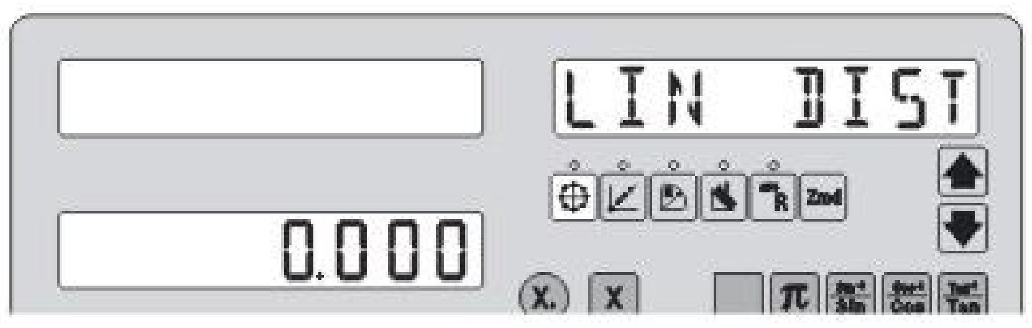


Posit cutting hole to the first hole position



press function key to enter SLH function

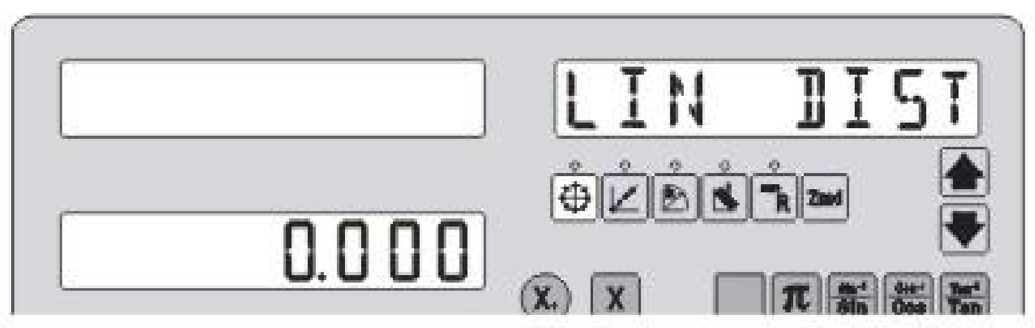




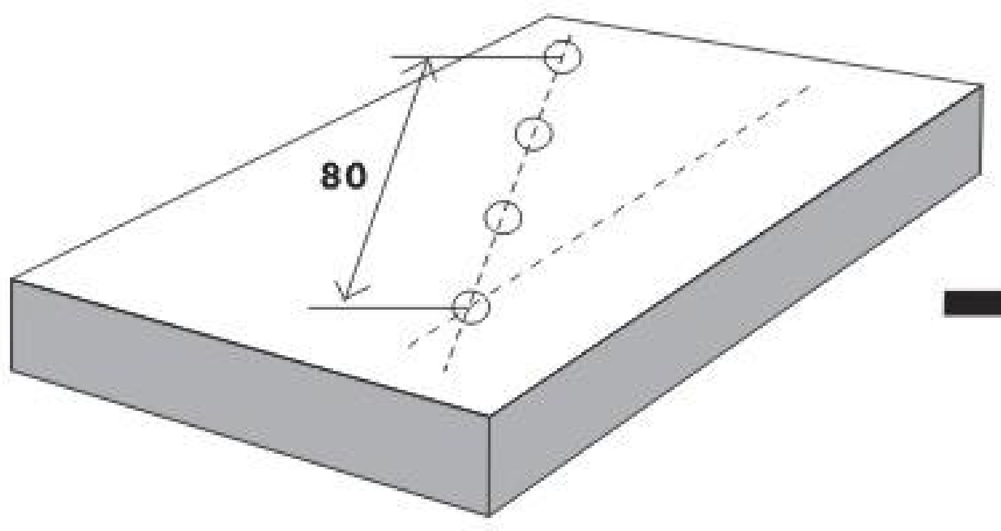
LIN DIST

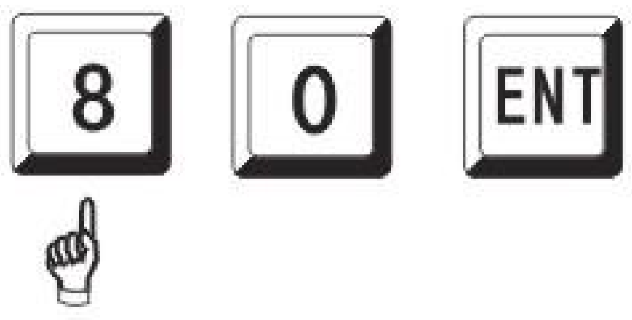
Step 2: enter length(LIN DIST)

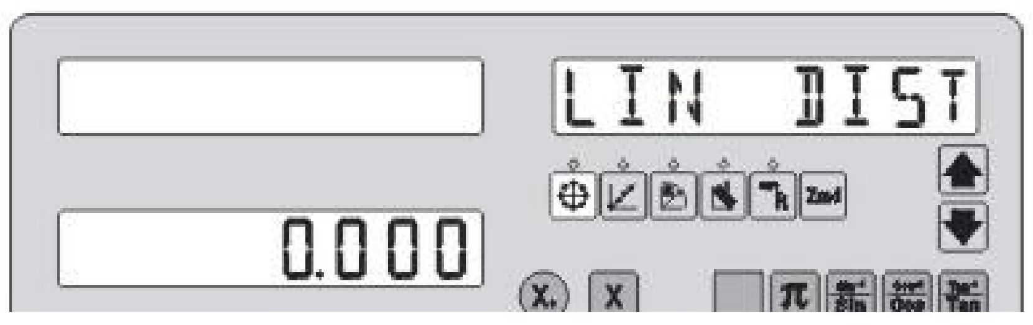
(LIN DIST)



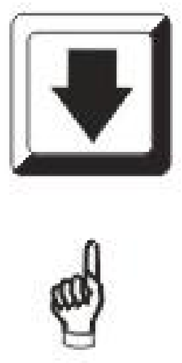
(LIN DIST) =80mm





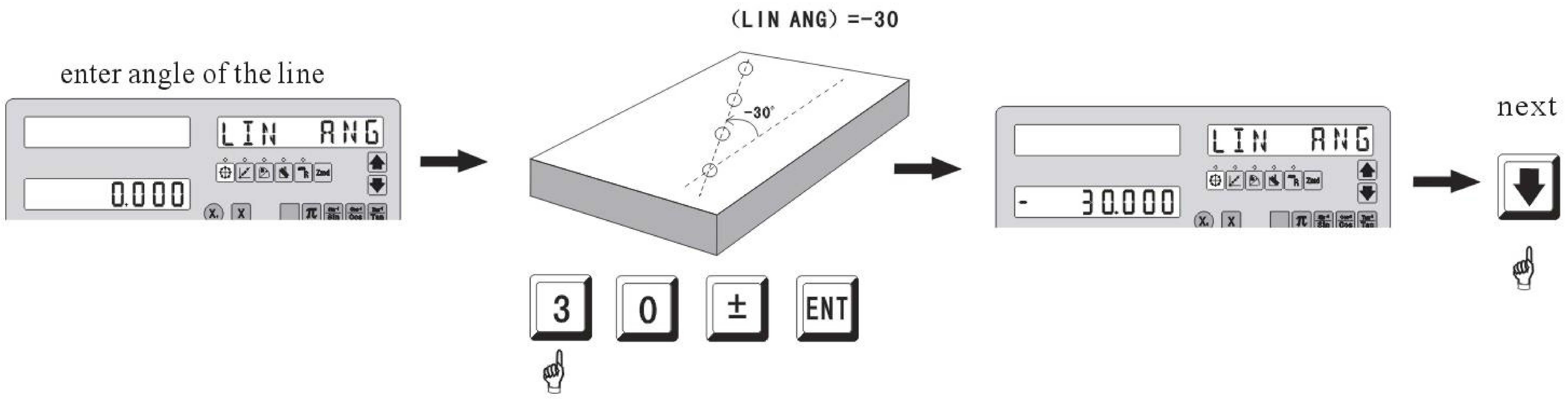


next

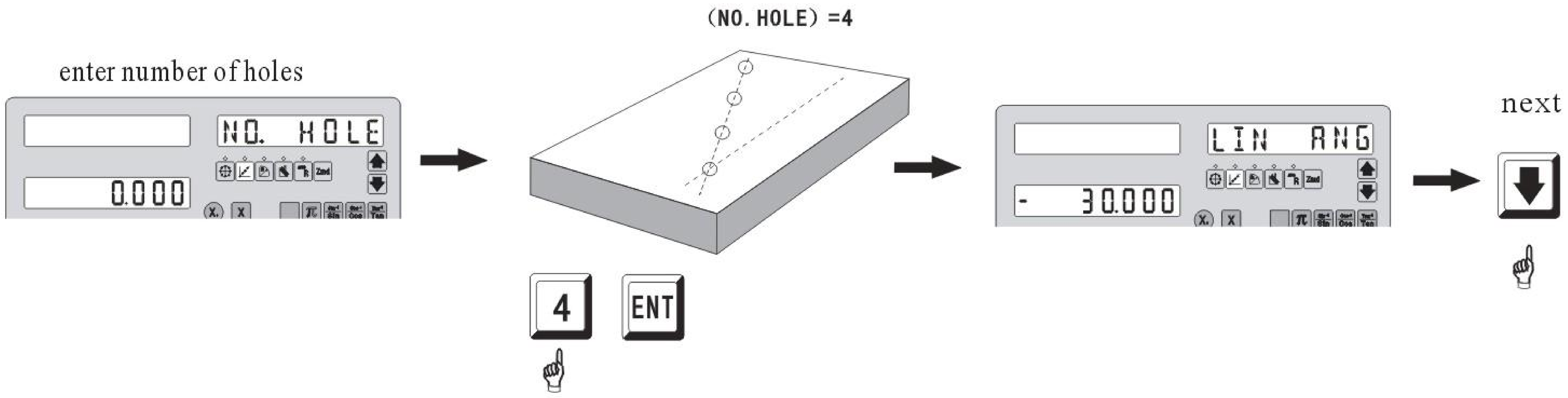


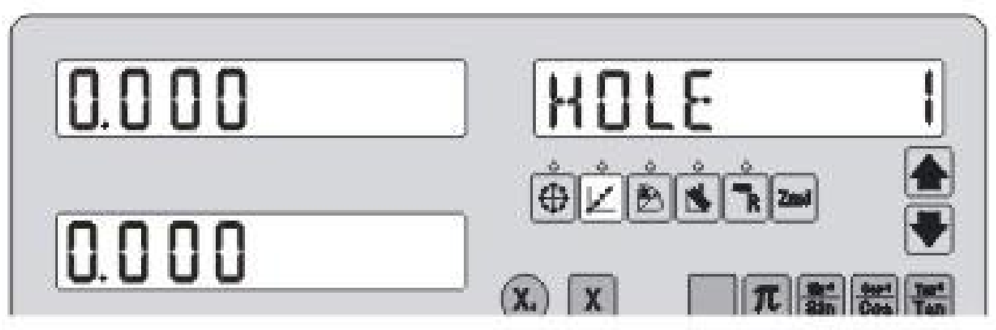
Sharing holes on the line (SHL) function

Step 3: enter angle of the line



Step 4: enter number of holes

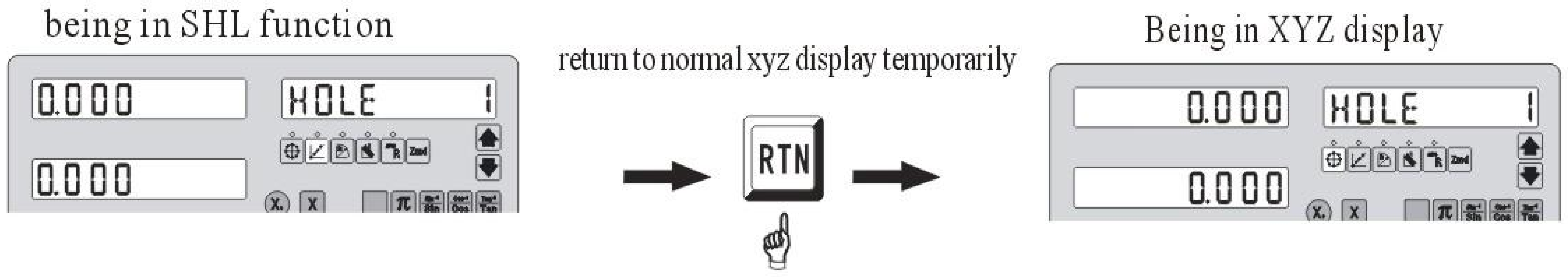


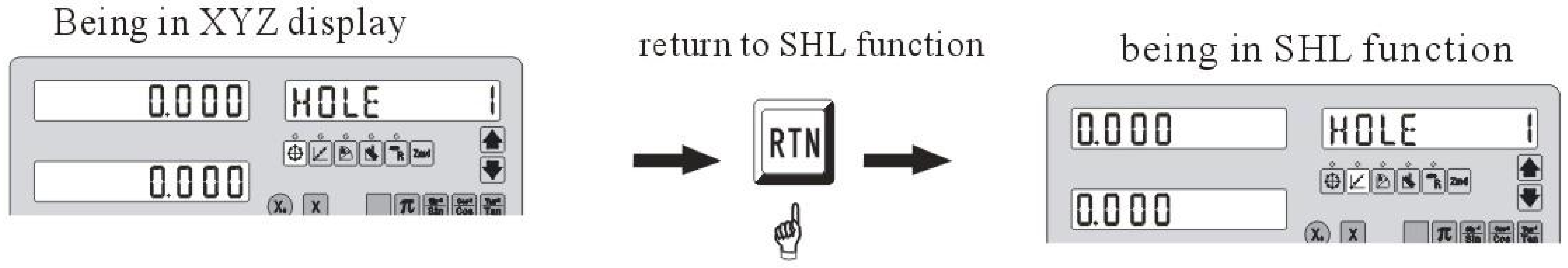


After enter all the parameters on of SHL, press ▼ key to enter into machining mode.

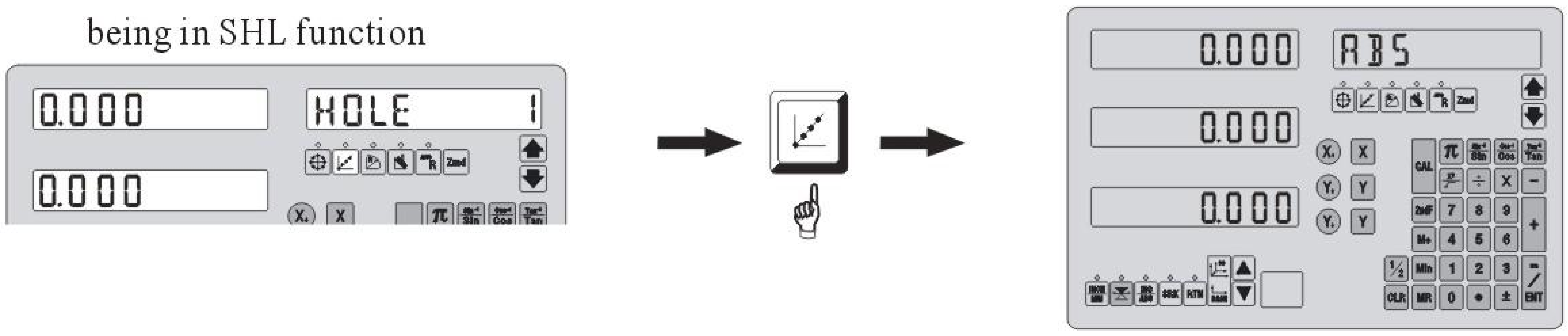
Using ▲ or ▼ to select one of the holes. Move the workpiece until axes display to 0.000 to get the position.

User can return to normal mode (XYZ) and temporarily exit SHL mode to check the calculated position at any time.





Finish SHL function and return to normal mode.



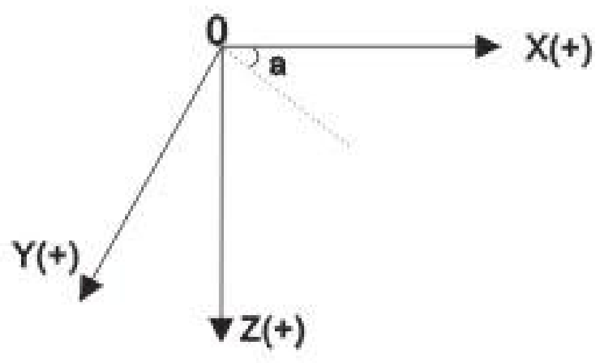
Machining inclined plane function

Digital display provides convenient machining inclined plane function
Users need only enter the following:

- machining plane selection (INCL XY/INCL XZ/INCL YZ)
- enter the degree of inclined plane (INCL ANG)
- enter the maximum cutting depth (MAX CUT)

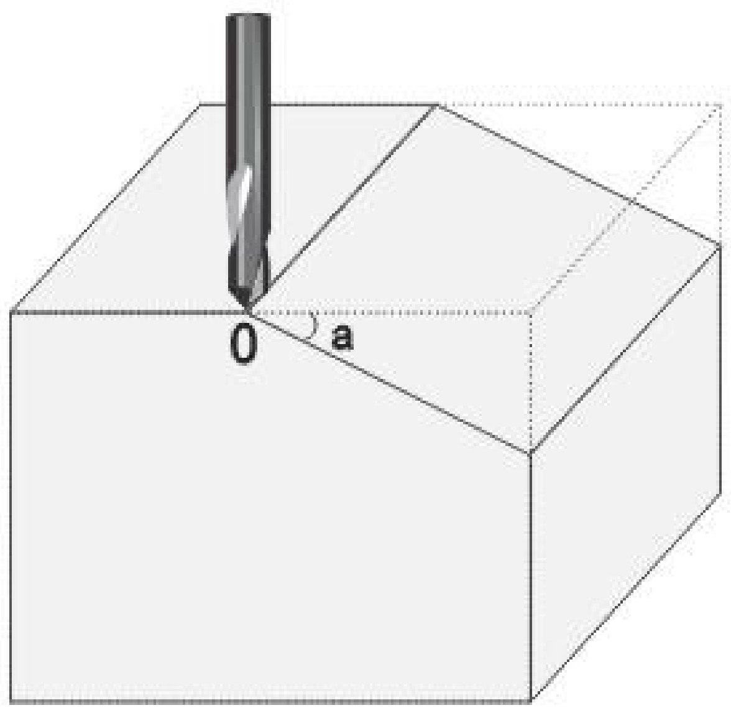
Example:

Machining plane (INCL XY/INCL XZ/INCL YZ) ----XZ plane (INCL XZ)
Degree of inclined plane (INCL ANG) ----30 degree (clockwise)
Maximum cutting depth ----0.5mm



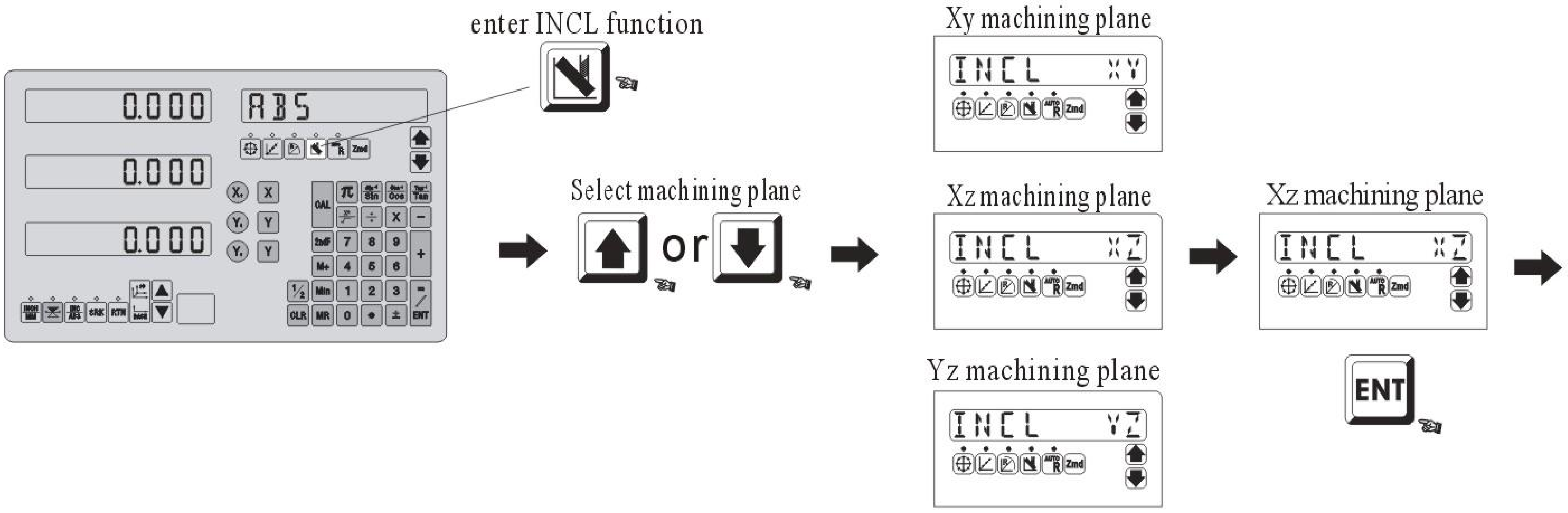
Firstly, fasten the workpiece on the machine tool and adjust the turning tool to 45degree. Then, set the spring tab of Z axis as '0.000'.

Enter the data of inclined plane.

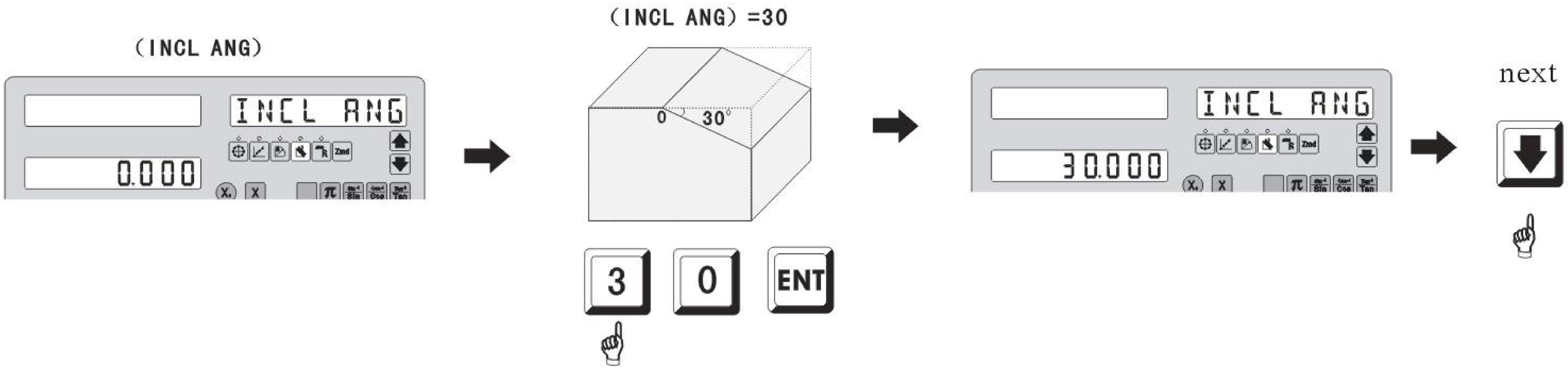


Operating Steps

Step 1: enter machining inclined plane function and select inclined XZ plane function.

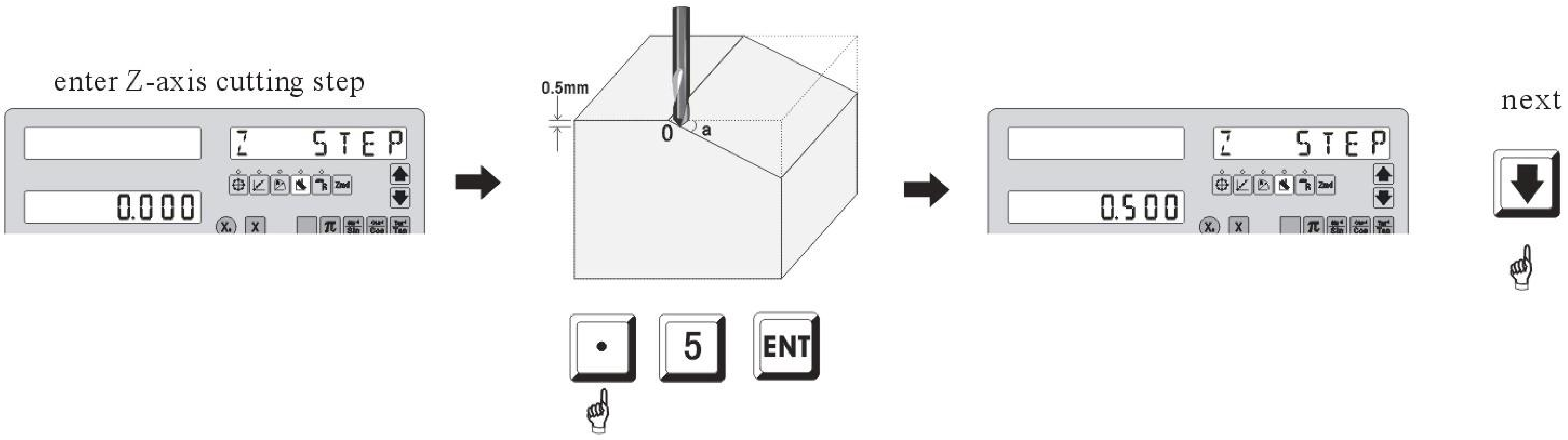


Step 2: enter the degree of inclined plane (INCL ANG)



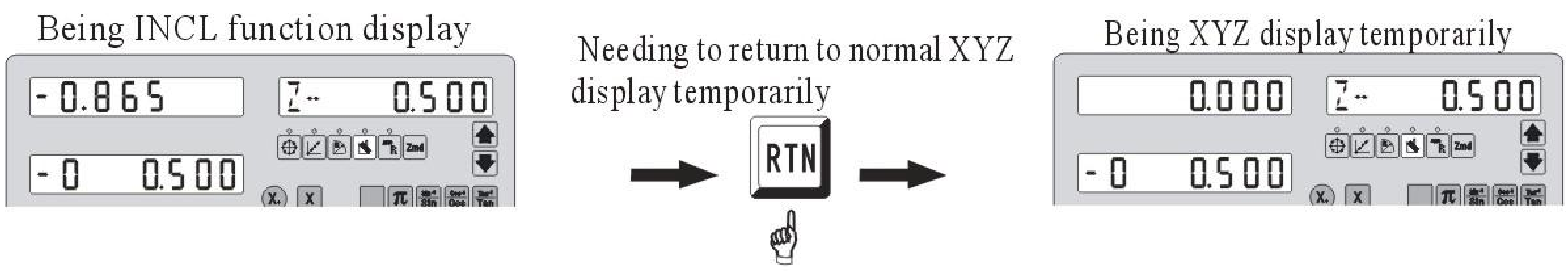
Machining inclined plane function

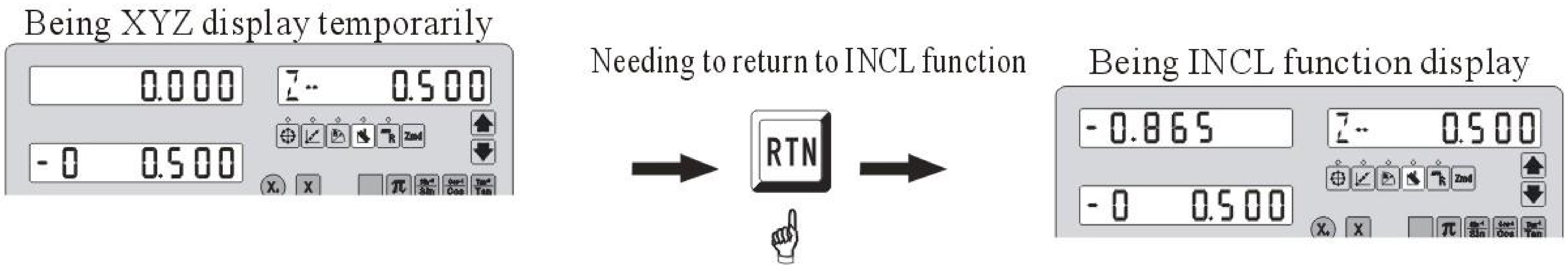
Step 3: input cutting depth of Z axis (Z STEP)



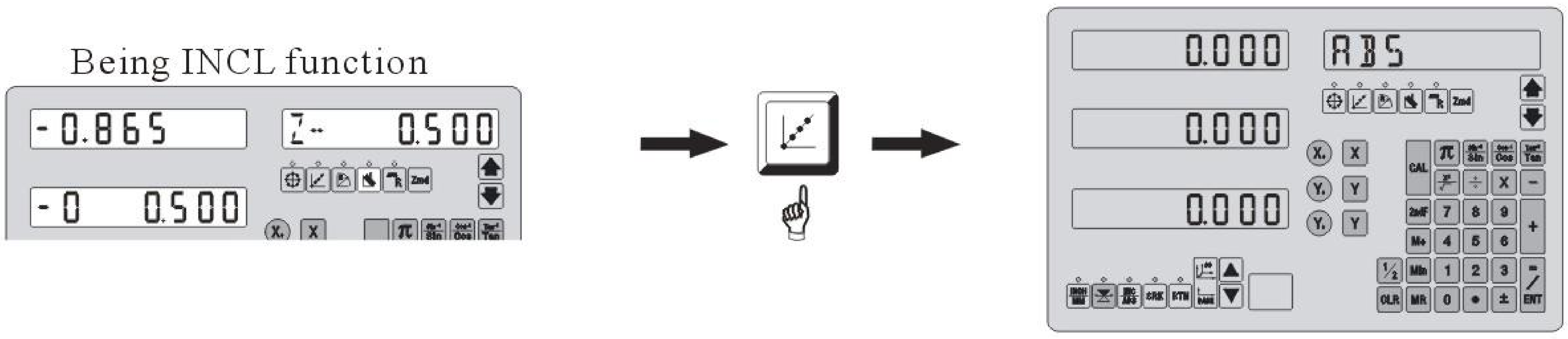
Since no Z axis is on the bi-axis digital display, ⬆ and ⬇ keys are used to set the Z axis position with emulated mode. By pressing the key ⬆ the machine tool is moved up one grade with emulated mode. By pressing the ⬇ key, the machine tool is moved down one grade with emulated mode. Before machining, move the Z-axis of machine tool to the initial Z-axis position of inclined plane, and then set the spring tab of machine tool Z-axis as '0.000'. The emulated Z-axis position is shown on auxiliary display.

For checking the position computed in digital display, operator may make digital display temporarily return to normal XYZ display from inclined plane machining mode (or function) at any time.


Being INCL function display
-0.865
Z-- 0.500
-0 0.500
Needing to return to normal XYZ display temporarily
RTN
Being XYZ display temporarily
0.000
Z-- 0.500
-0 0.500


Being XYZ display temporarily
0.000
Z-- 0.500
-0 0.500
Needing to return to INCL function
RTN
Being INCL function display
-0.865
Z-- 0.500
-0 0.500

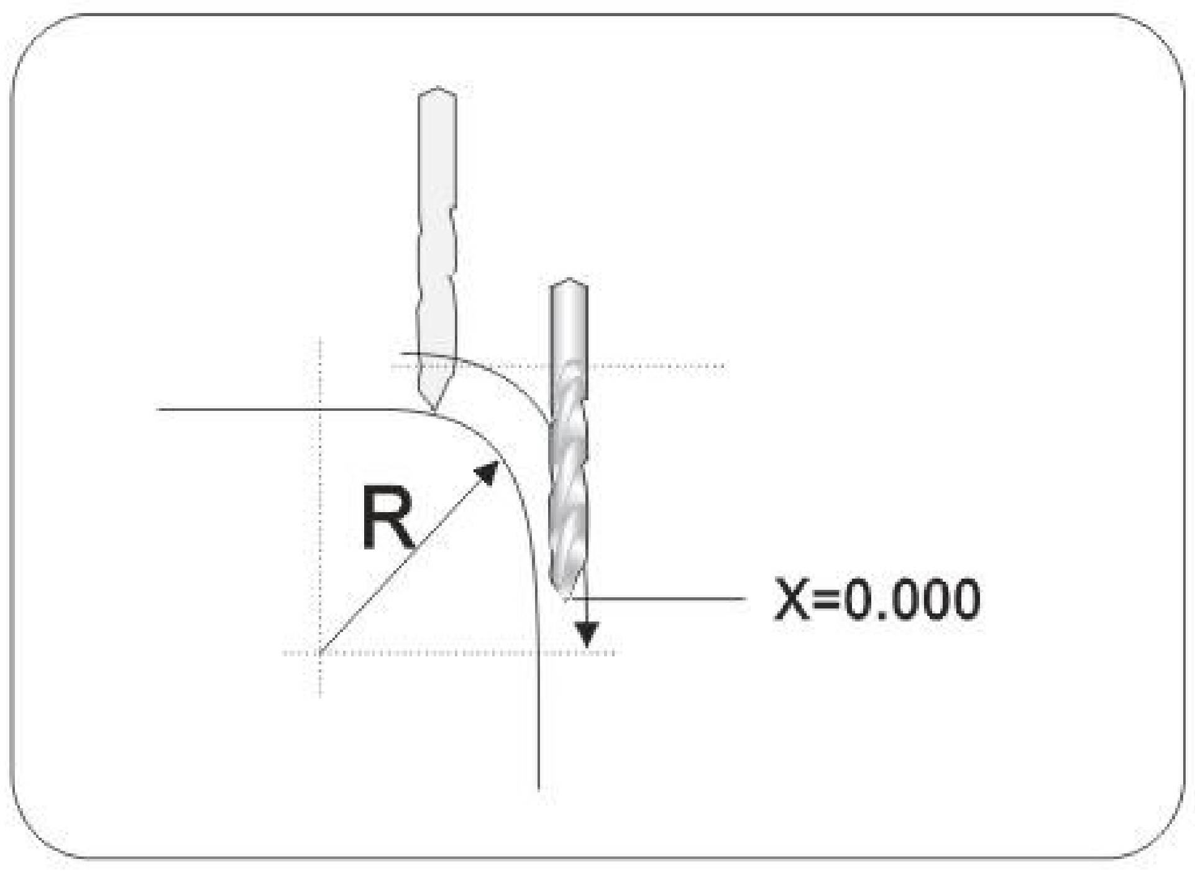
Returning to normal display after finishing INCL machining



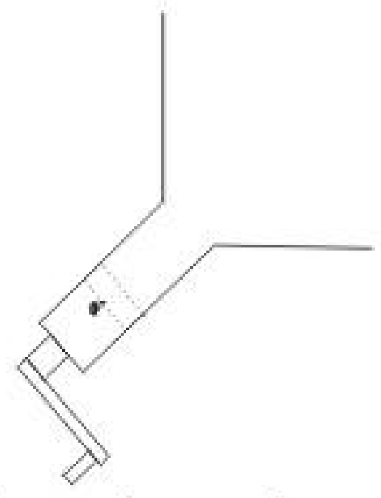
Machining inclined plane function

The display and operation of bi-axis under INCL function

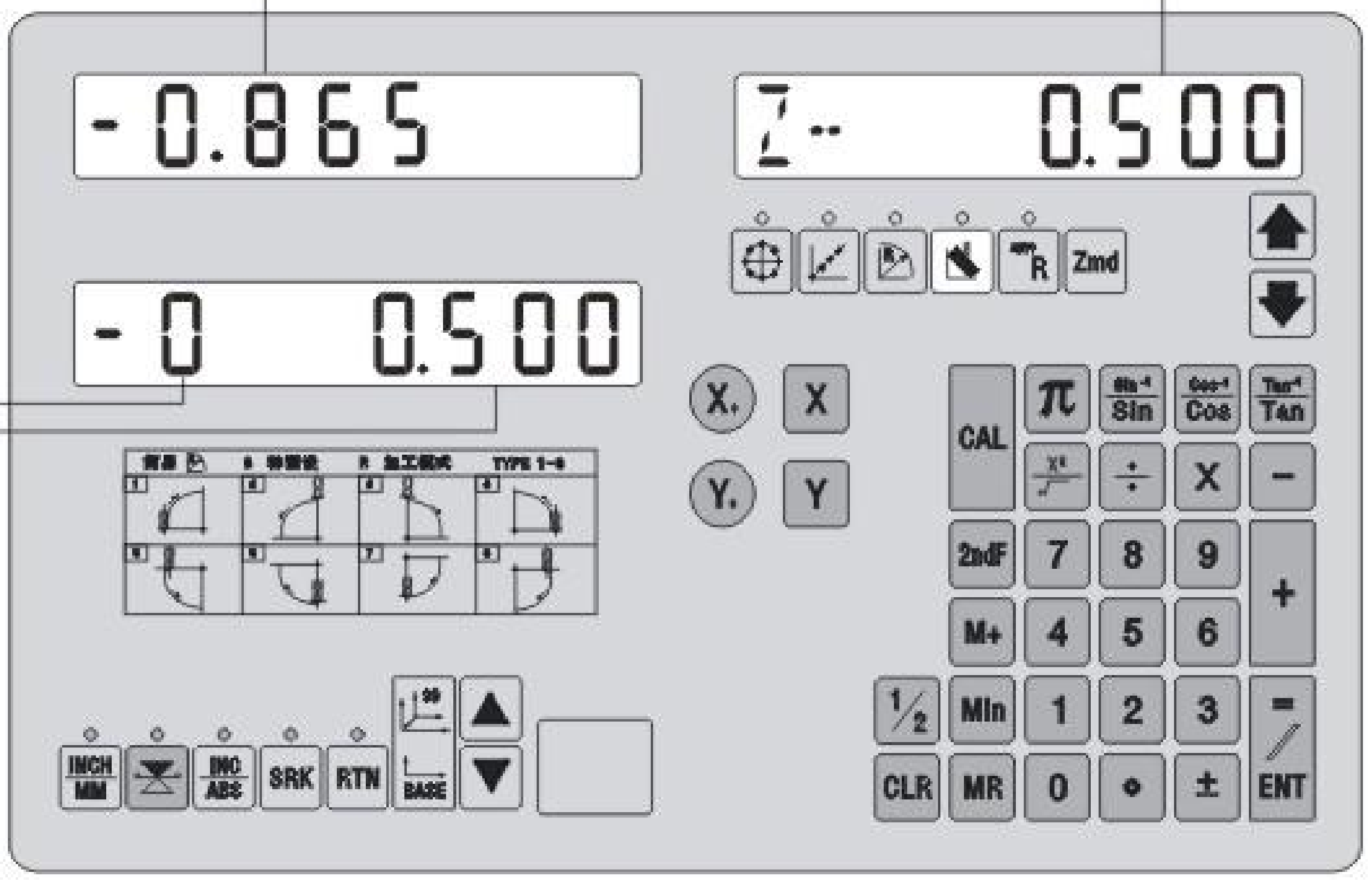
Since no Z axis on the bi-axis digital display, it has to display the spring tab scale and its turn number of Z-axis in the way of emulation on the unoccupied axis. In the course of working,the initial point height of inclined plane on Z-axis is set as '0.000'. And in the working course of incline plane, the spring tab scale and its turn number are automatically transformed from the current machining height of Z-axis, which will lead operator to complete the processing easily.



move the machine tool to the position of X=0.000 and this height is inclined plane Z height



Z-axis spring tab set as “ 0 ”



to distinguish from the normal display and avoid the operator making mistakes, the abnormal display will move to the left side

emulated Z-axis height

move the machine tool to the position of X=0.000 and this height is inclined plane Z height.

the turn number of Z spring tab

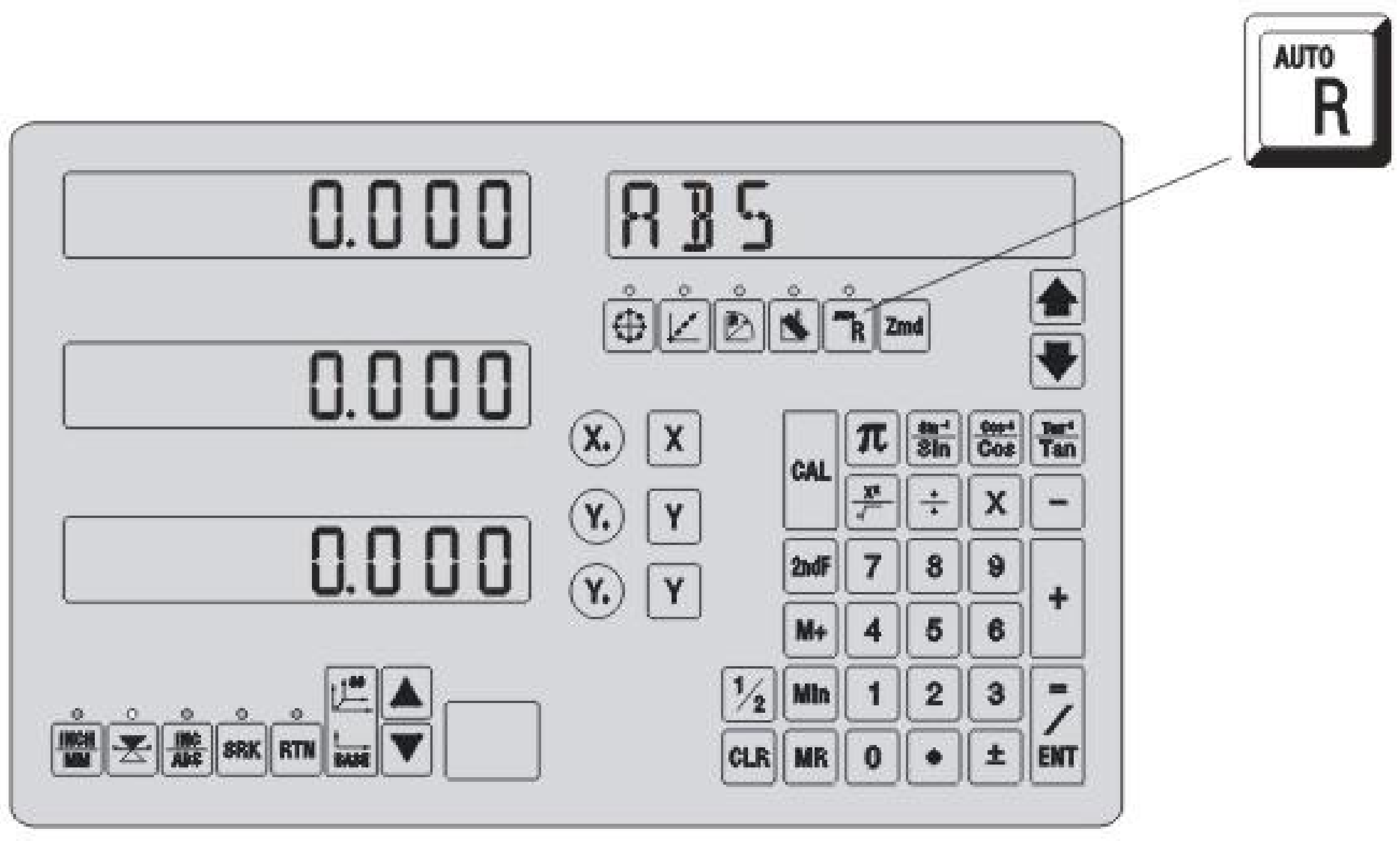
the scale of Z spring tab

Note: the above is operating instructions of incline plane function on two-axis digital display. Inclined plane function of three-axis display: except XY cutting plane, XZ and YZ need not input cutting step, as well as press ⬆ or ⬇. Select cutting step and move Z-axis of grating directly, i.e. the cutting step of Z-axis. The coordinate of X or Y will change with cutting step and move the value to 0.000, i.e. the position of machining.

R function

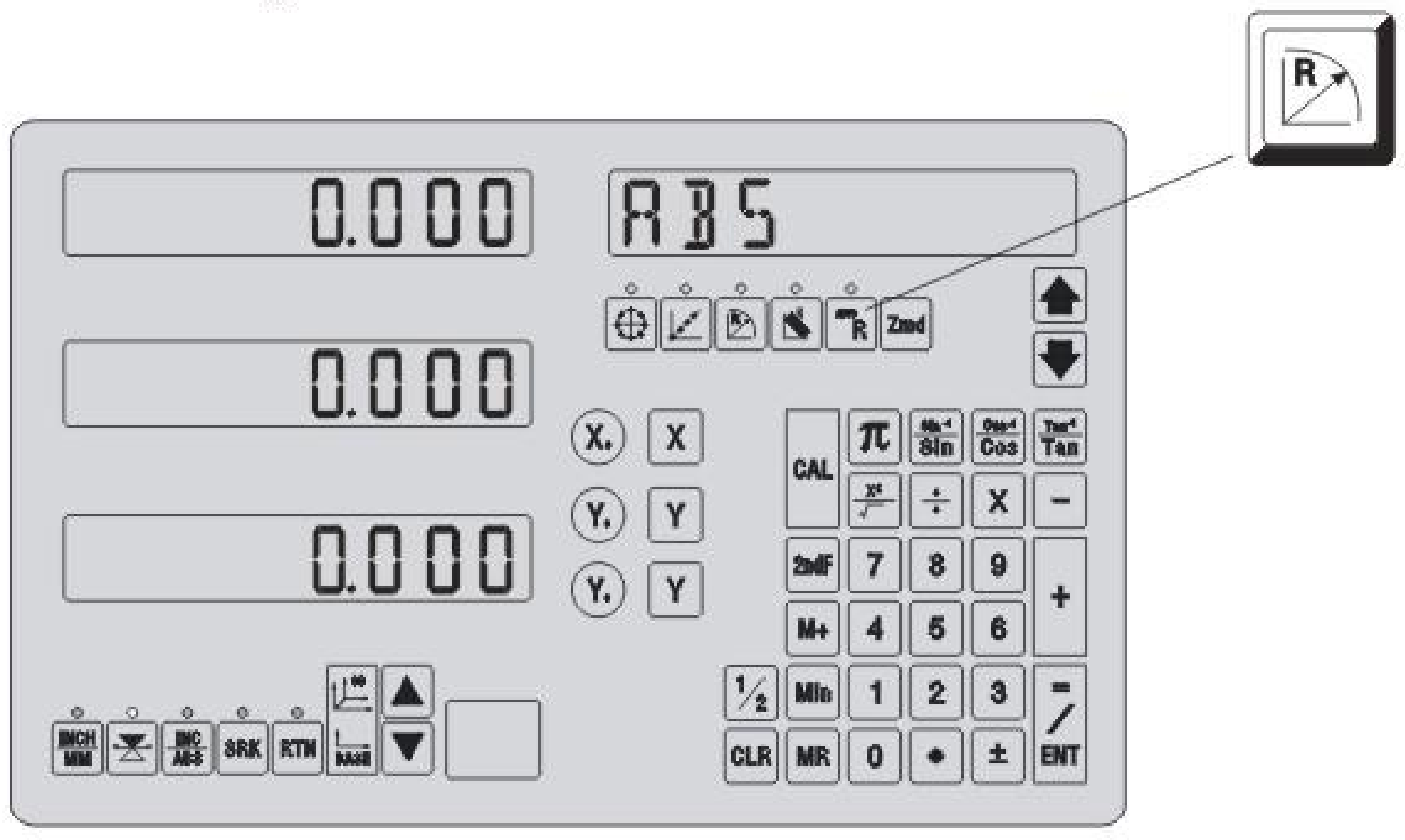
R function set of this digital display has two R functions, namely R function and Simple R function.

R function



R function: operator can use R function to process the most complete arc, even arc connecting arc.
Advantage: processing the most complete arc, even extremely complicate arc connecting arc.
Disadvantage: operation is complicate.
Operator should know basic coordinate system in order to compute the starting point, end point and center point of R.

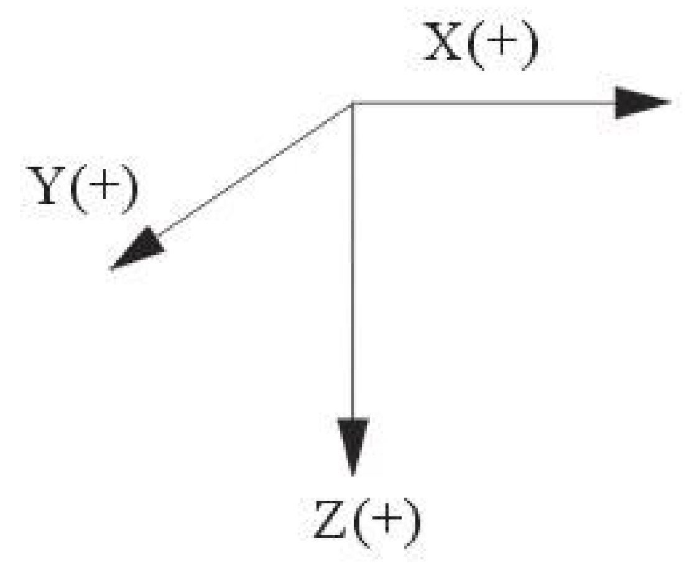
simple R function



Daily machining arc by manually operated milling machine is simple. However, it may take one month to process one or two arcs by manually operated milling machine. Simple R function needs no computation and can process arc easily.
Advantage: direct and simple operation. Operator needs not to know any calculator function or basic coordinate system
Disadvantage: only 8 commonly used types can be processed. Comparatively complicate arc cannot be processed.

Coordinate system:

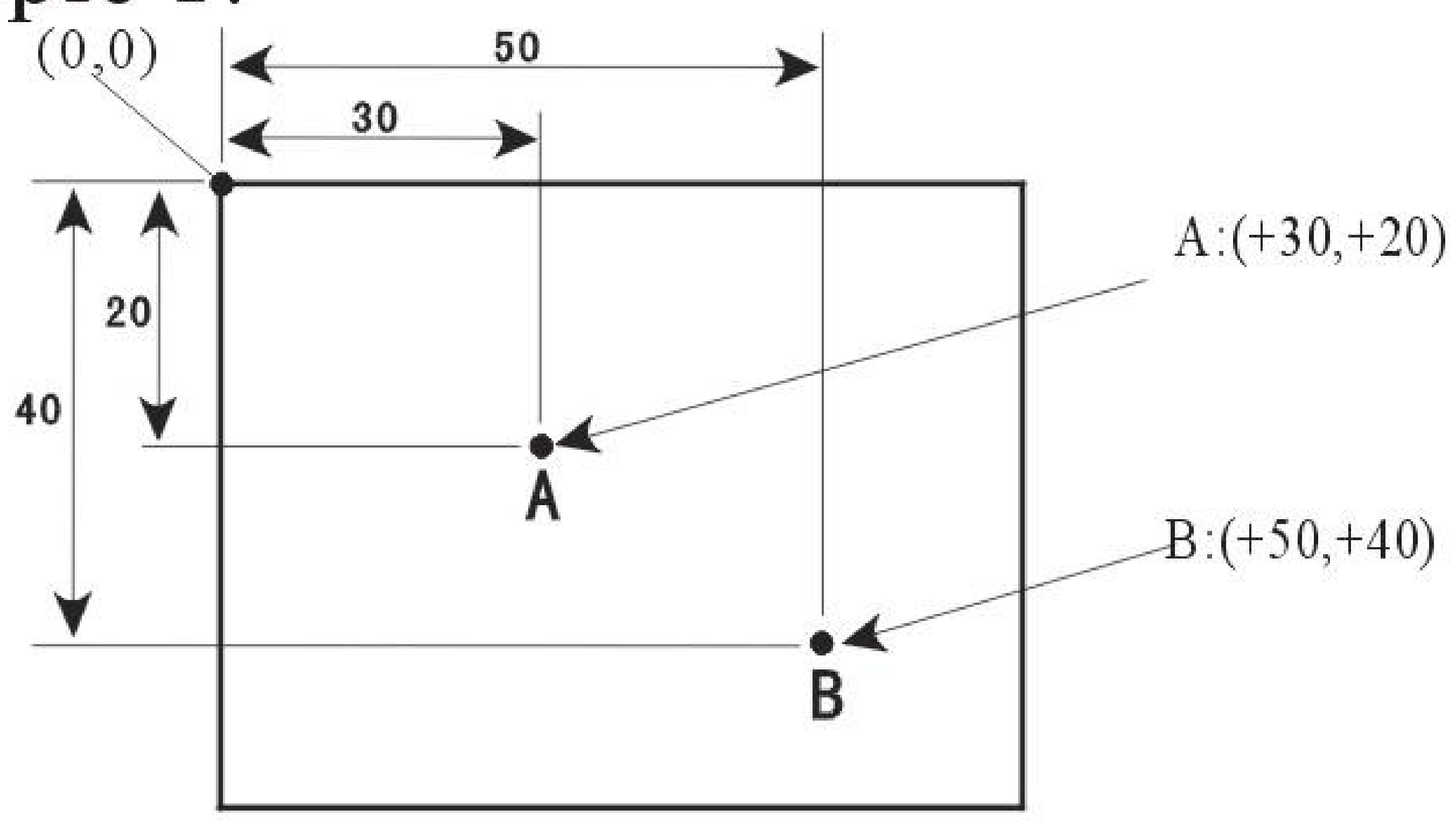
For operators without CNC programming experience, when using R function, the most difficult challenge is that he does not know the coordinate system. Our company's installation technician will adjust positive and negative direction. Consistent with the spring tab of the machine tool.

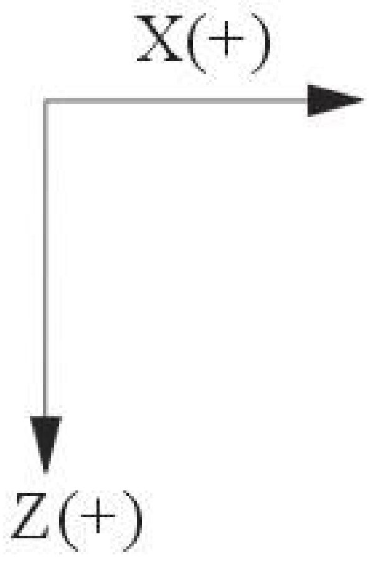


What is coordinate?

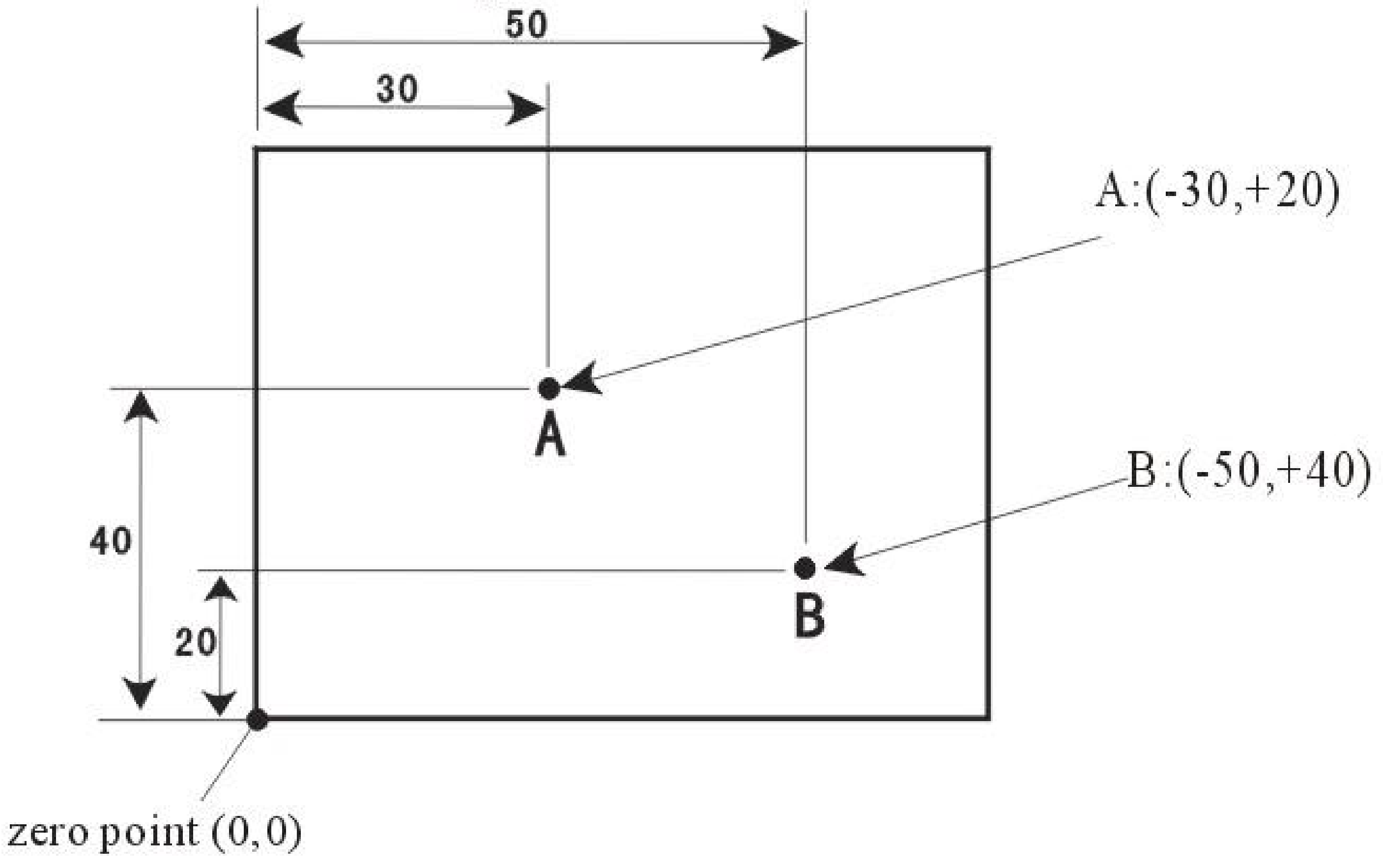
Coordinate is a way to express position. In plane machining, every set of coordinate has two values and the distance is relative to the zero point of the plane. The following are simple examples.

Example 1:

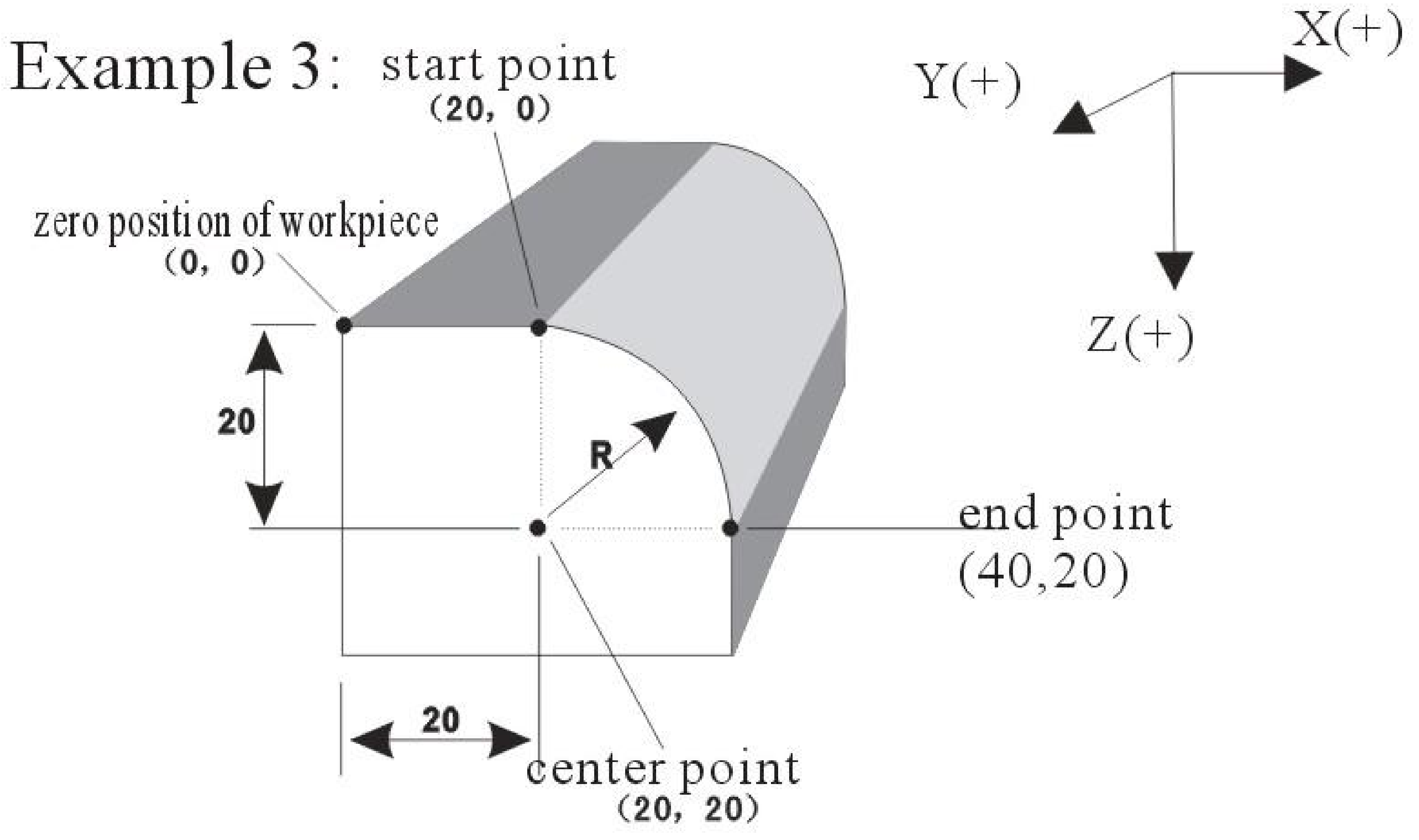


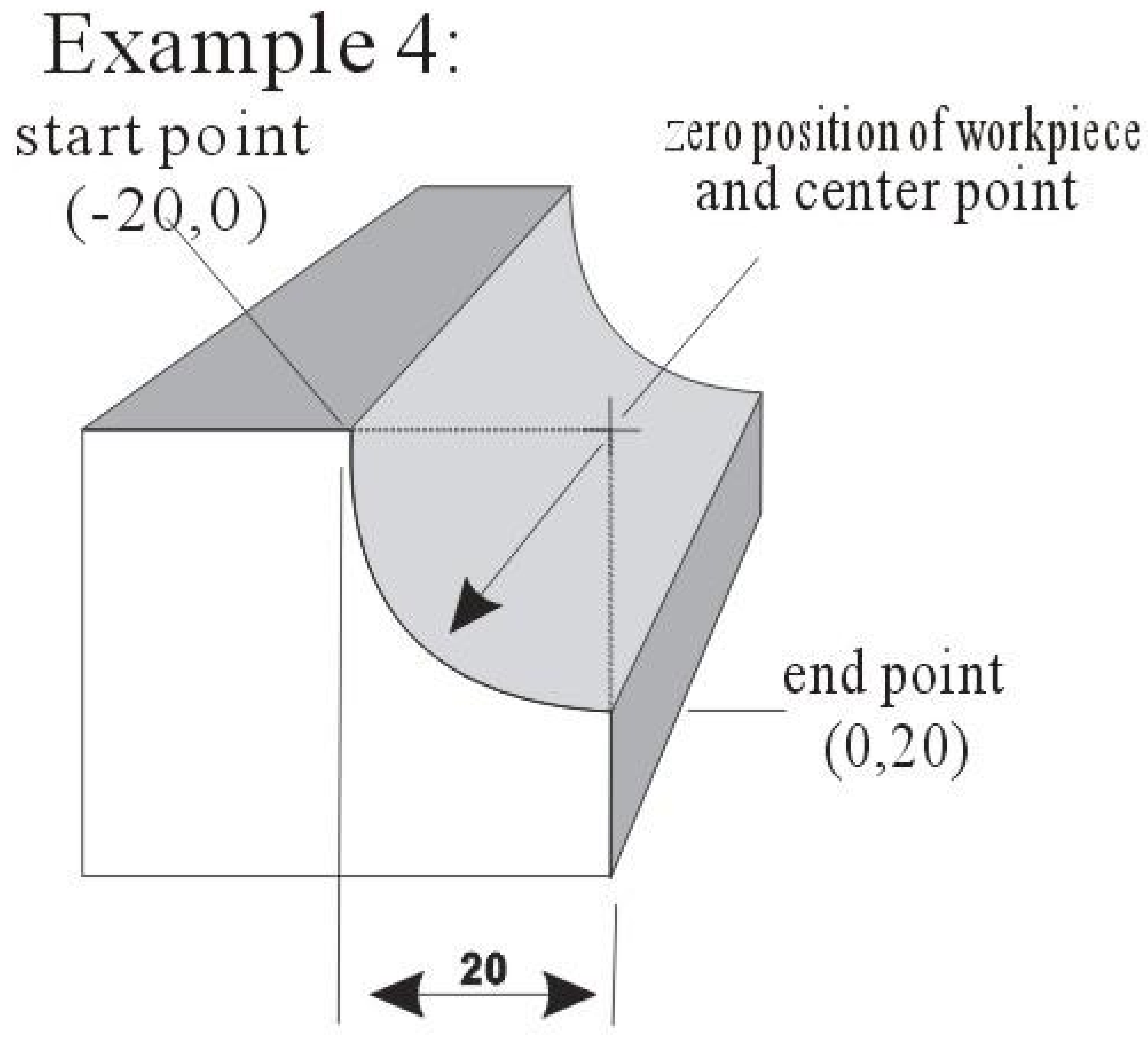


Example 2:



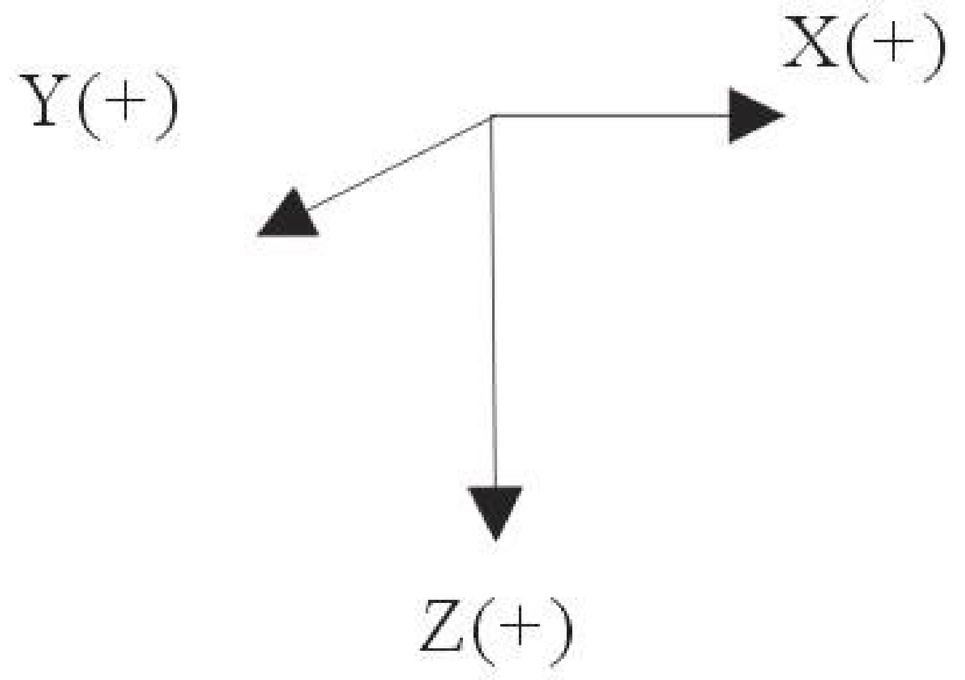
R function

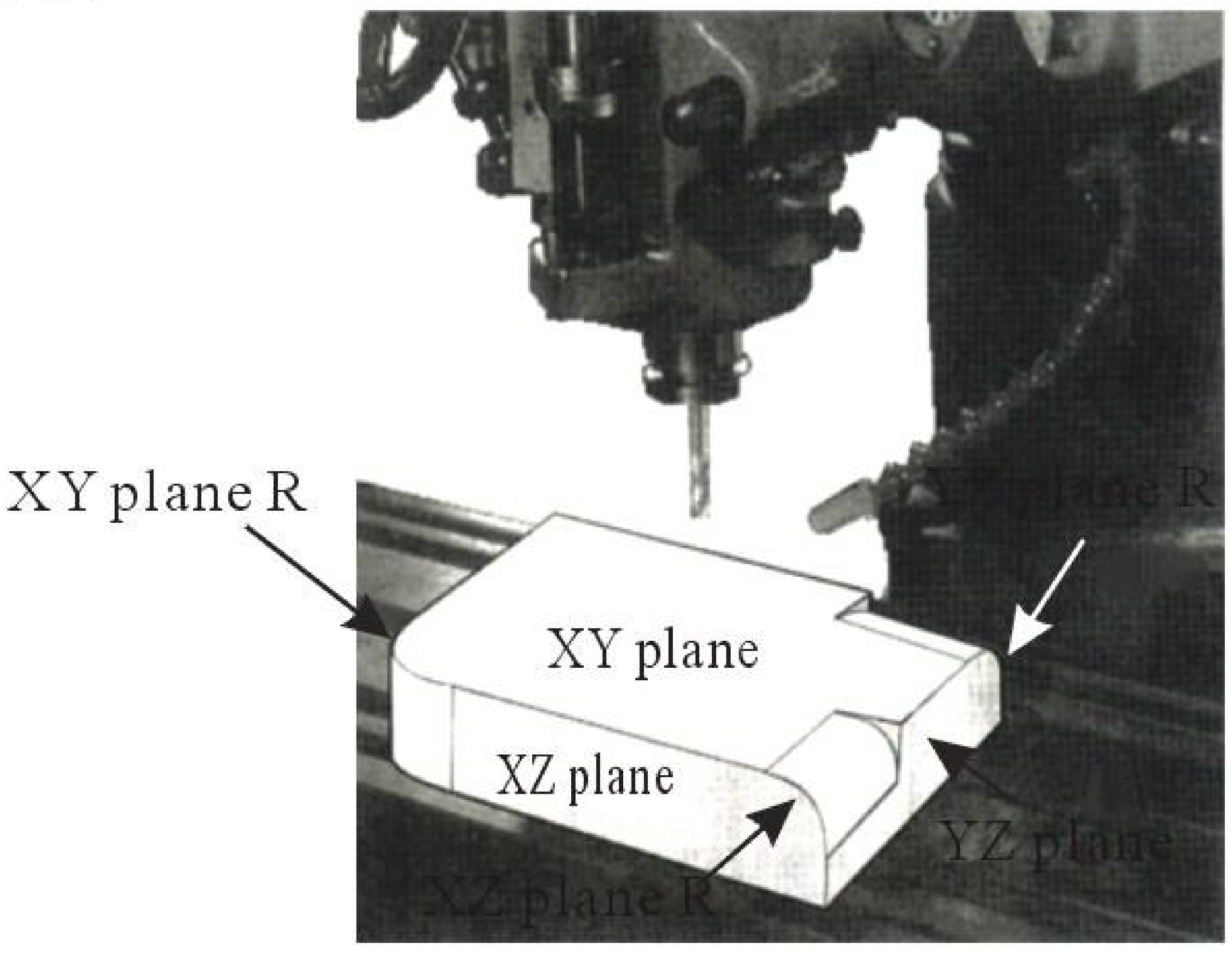




Plane machining:

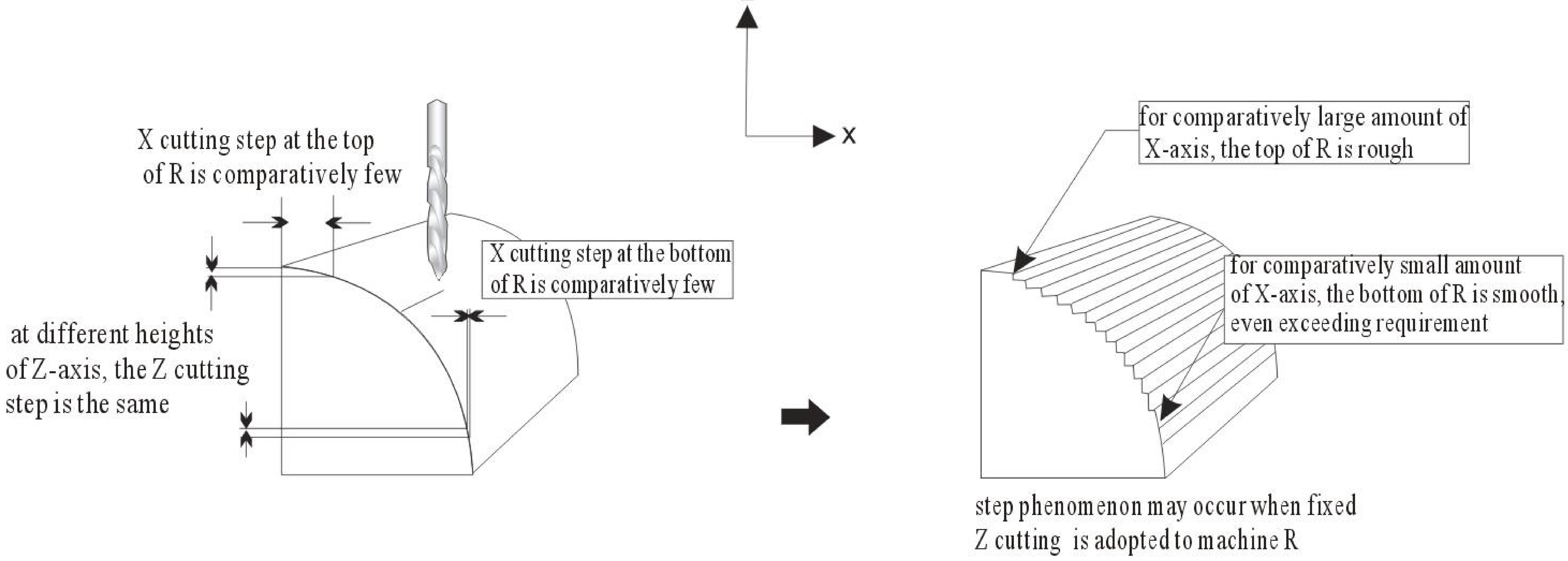
R function can process arc in XY plane, XZ plane and YZ plane. When using R function, operator need select the plane to machine and use digital display to compute the machining coordinate of R.





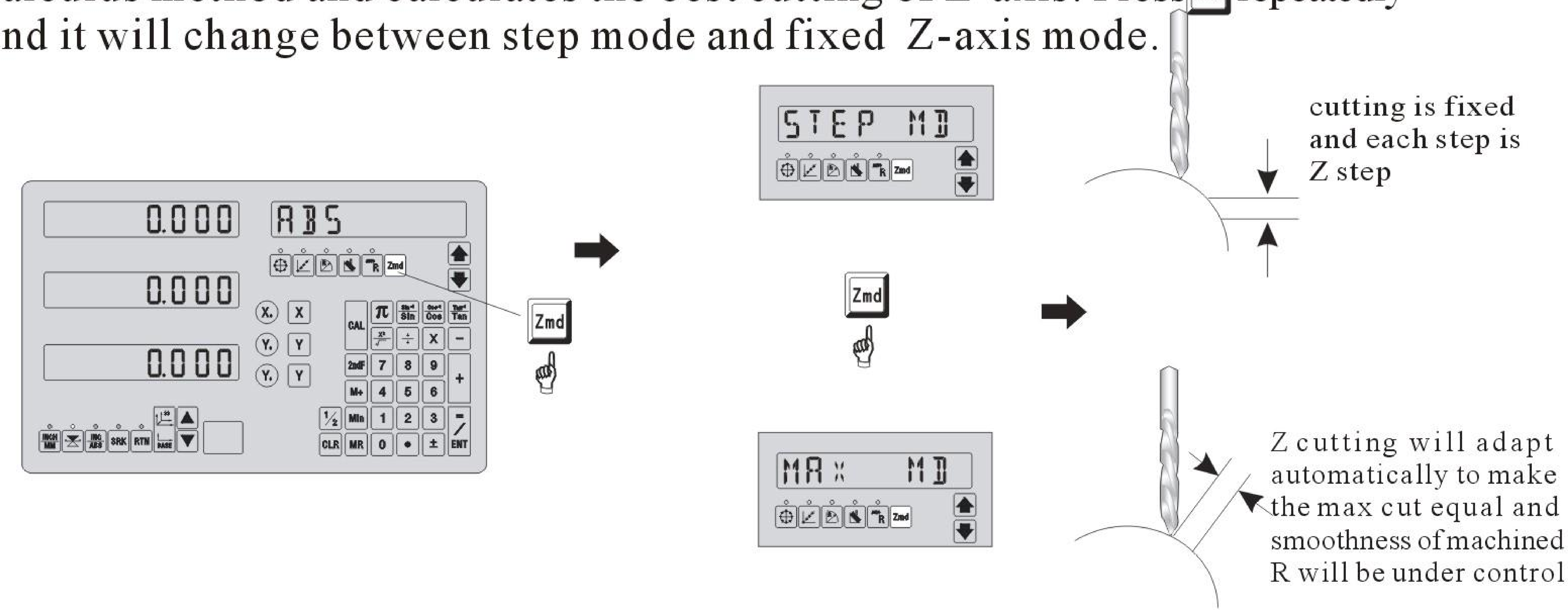
Smooth R function and fixed Z-axis step

Because of the geometric shape of R, the amount of machining is different when Z-axis is at different heights. If fixed cutting of Z-axis is adopted to machine R, step phenomenon will appear. When processing small radius R, this disadvantage is particularly evident.


Z
X
X cutting step at the top of R is comparatively few
X cutting step at the bottom of R is comparatively few
at different heights of Z-axis, the Z cutting step is the same
for comparatively large amount of X-axis, the top of R is rough
for comparatively small amount of X-axis, the bottom of R is smooth, even exceeding requirement
step phenomenon may occur when fixed Z cutting is adopted to machine R

R function

Smooth R function solves this problem perfectly. Smooth R function adopts calculus method and calculates the best cutting of Z-axis. Press Zmd repeatedly and it will change between step mode and fixed Z-axis mode.



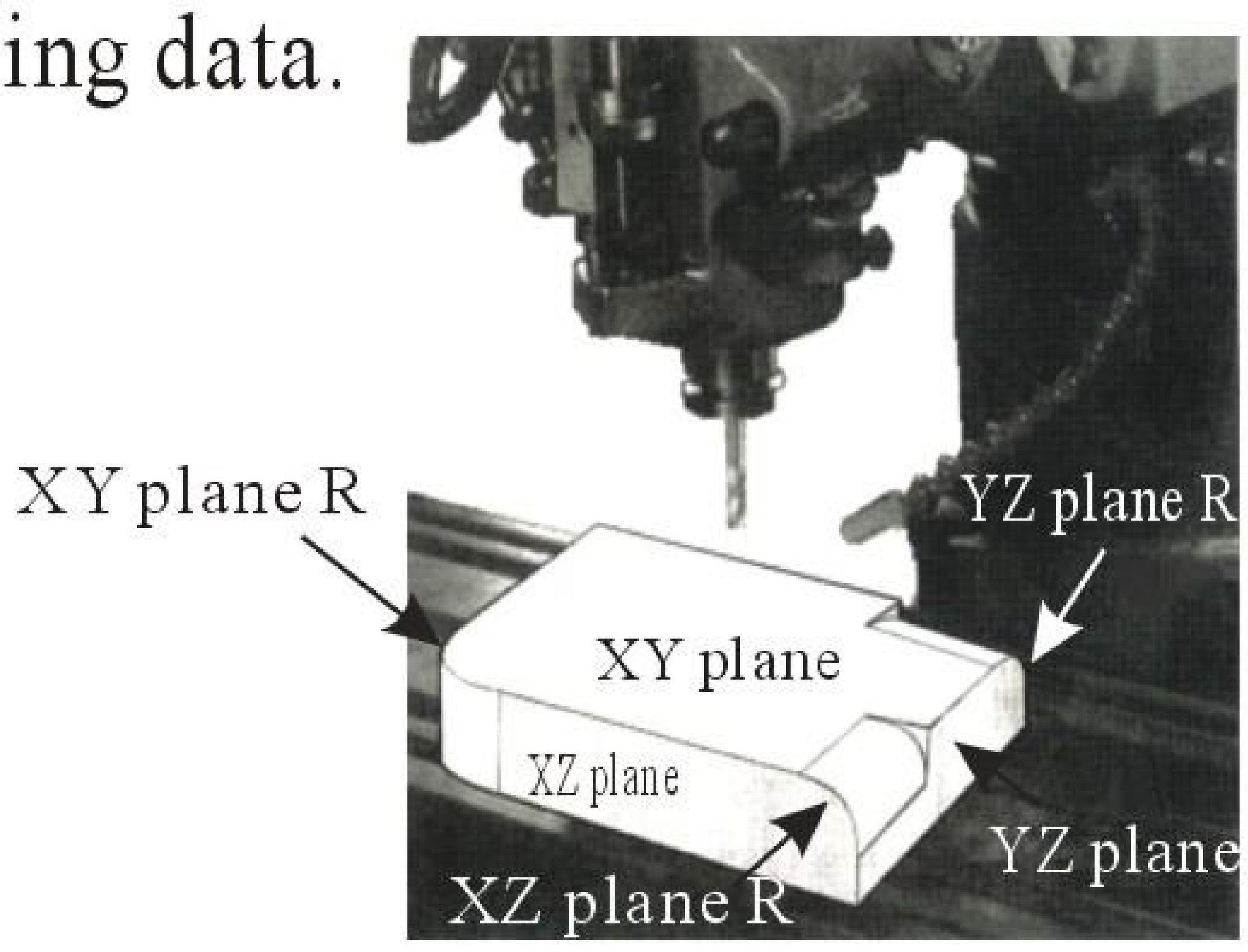
cutting is fixed and each step is Z step

Z cutting will adapt automatically to make the max cut equal and smoothness of machined R will be under control

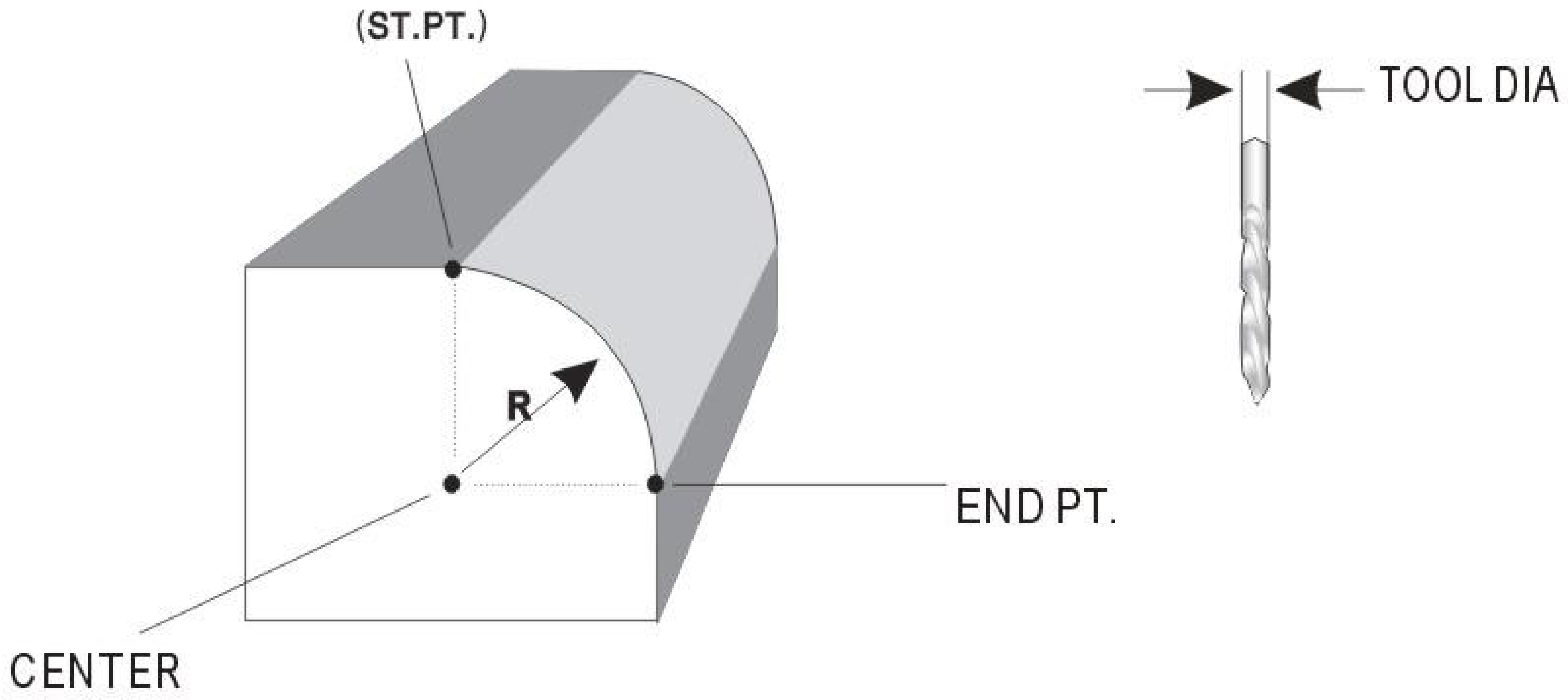
Attention: after the above selection is finished and enter R function or simple R function, the cutting of Z-axis will step according to the mode selected.

When using R function, operator need input the following data.

1.Select machining plane: XY, XZ or YZ plane.



2.Center point of R (XY CENT/XZ CENT/YZ CENT)



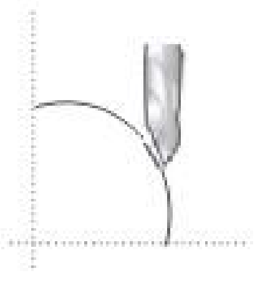
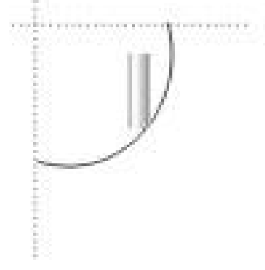
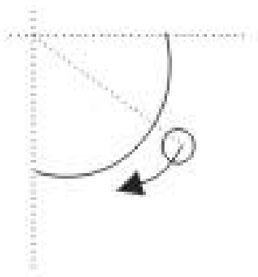
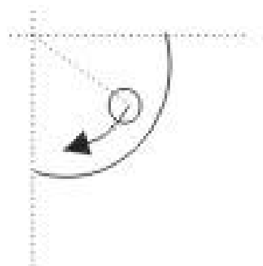
3.Radius

4.Starting point of R

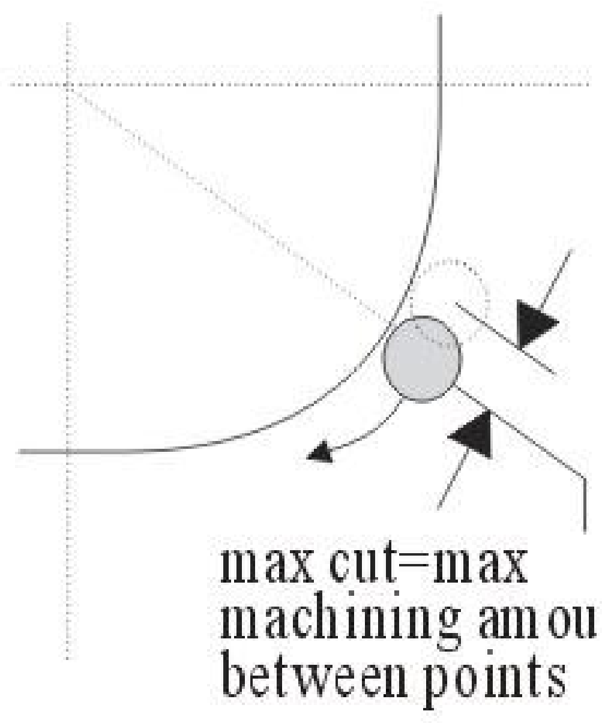
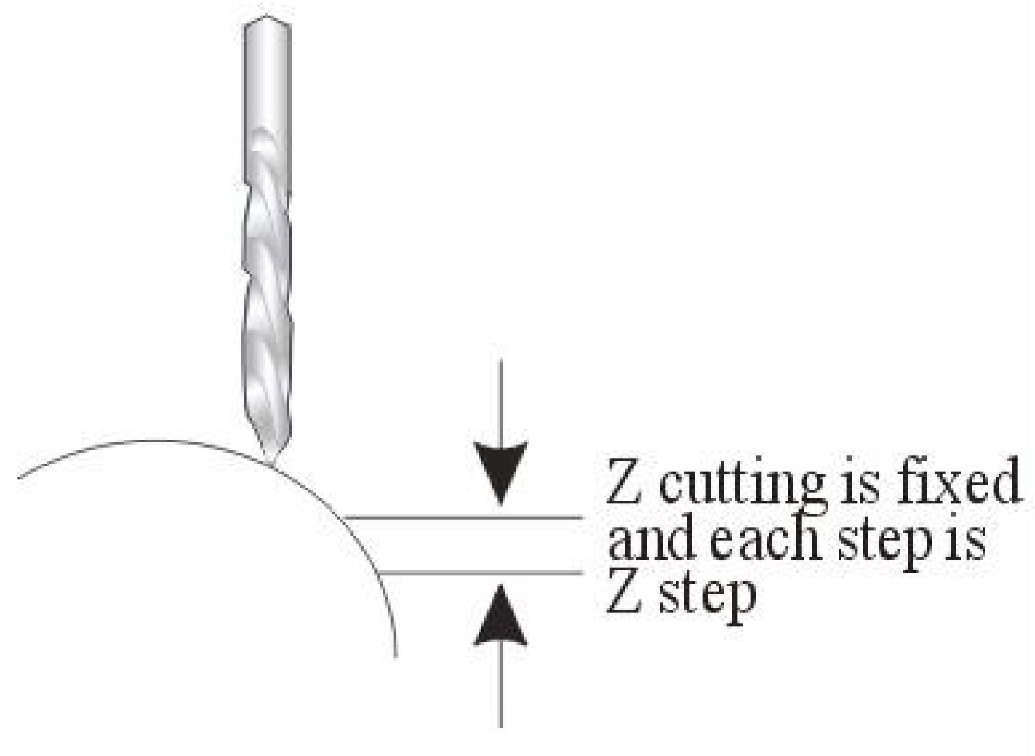
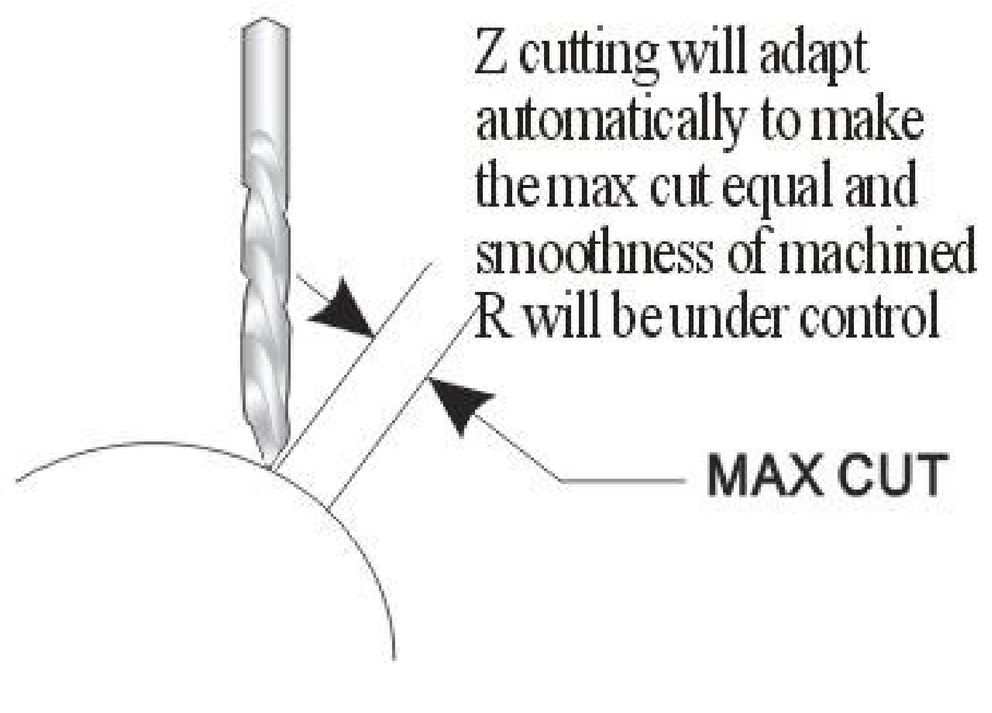
5.End point of R

6.Tool diameter

7.Select R+Tool or R-Tool

	Outside R+TOOL	Inside R-TOOL
XZ/YZ plane R		
XY plane R		

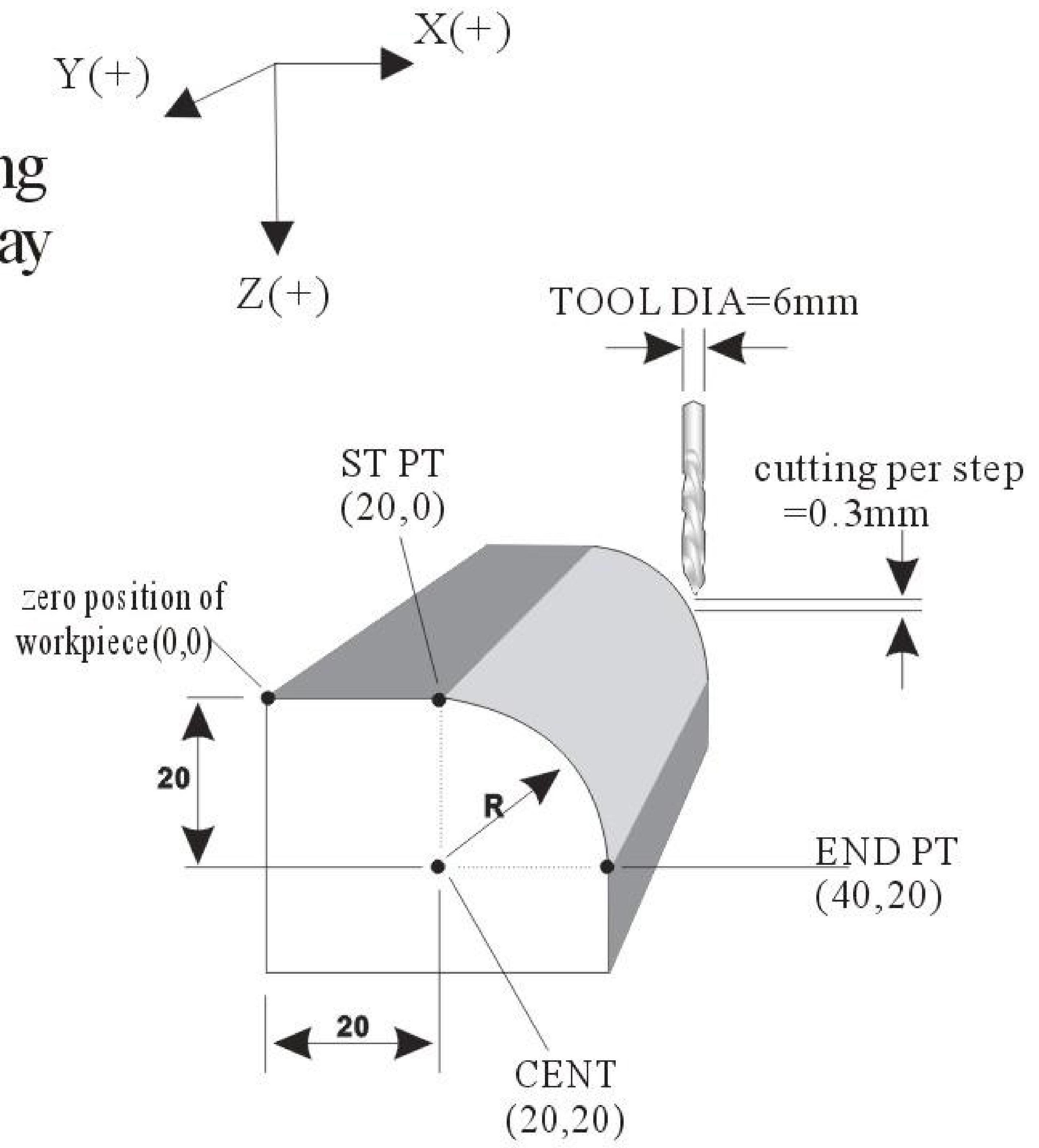
8.Max cut/ Z step

XY plane R	XZ/YZ plane R	
under XY plane R function, cutting of each point is max cut  	usually the cutting step of each point is each Z step  	under smooth R function, cutting of each point is max cut  Z cutting will adapt automatically to make the max cut equal and smoothness of machined R will be under control MAX CUT

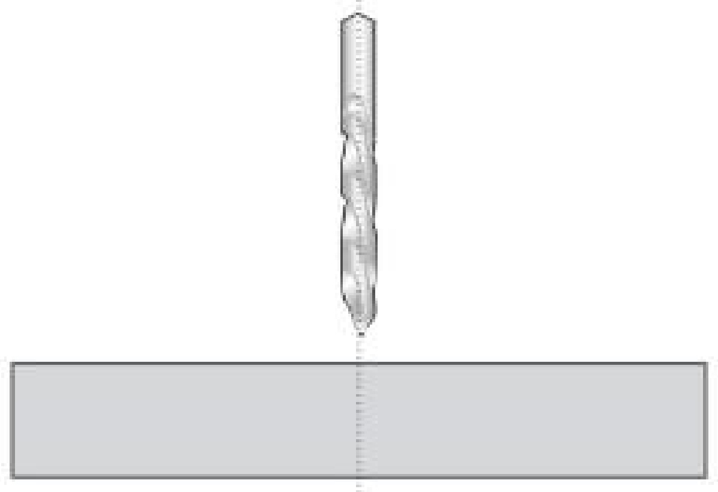
Example:

When using two-axis digital display, and processing the following R, use R function of two-digital display and input the following data:

1.Select XZ plane to process R (2X. R XZ).
2.Center point position (XZ CENT)······X=20.000, Z=20.000
3.Radius ·····································20.000
4.Starting point (XZ ST PT) ············X=20.000, Z=20.000
5.End point (XZ END P)··················X=40.000, Z=20.000
6.Tool diameter······························6.000mm
7.Select R+Tool, since practical arc is the radius of R+Tool.
8.Cutting of each Z step ··················0.5mm

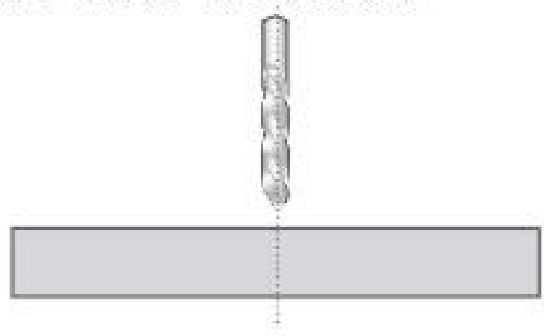


First, fix the workpiece on the machine tool and posit the tool to the center of the workpiece, namely the starting point of R. Then, set the spring tab of Z as 0.000.

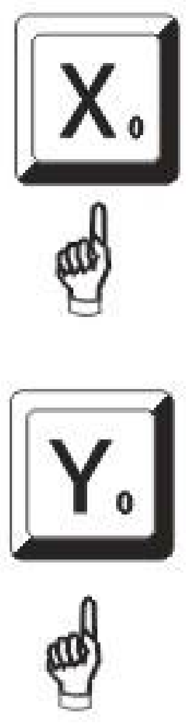


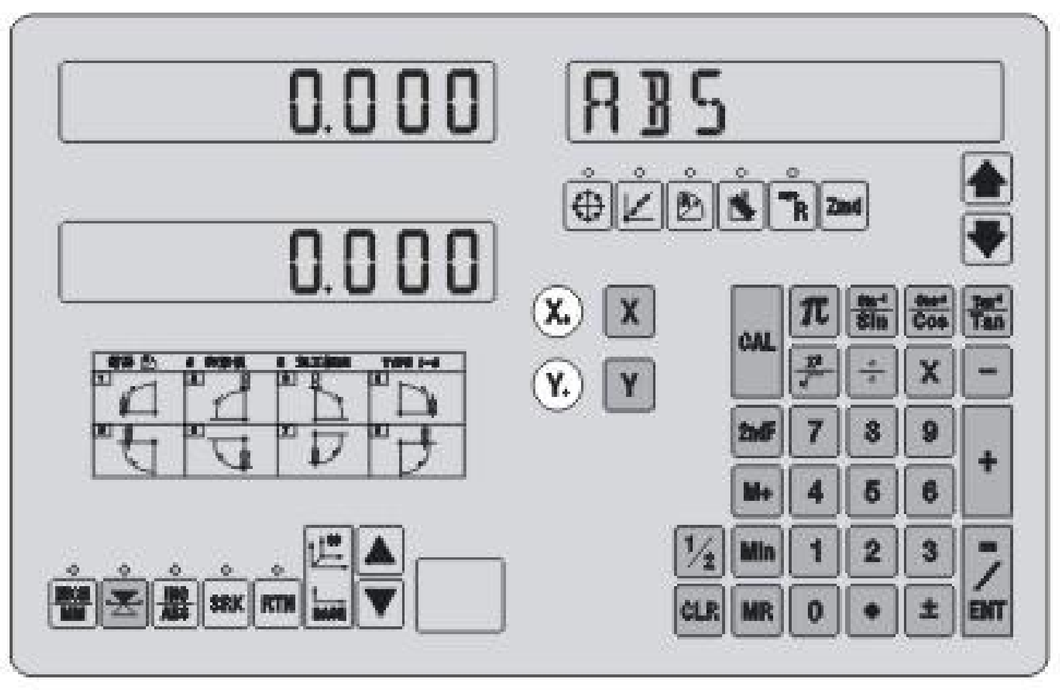
Operating steps:

Move machine tool and posit tool to the plane of the workpiece center (the ST PT of R), then set the spring tab of Z as 0.000

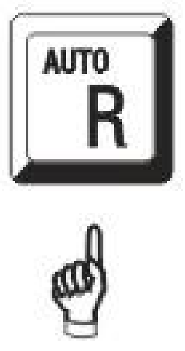


Clear XY

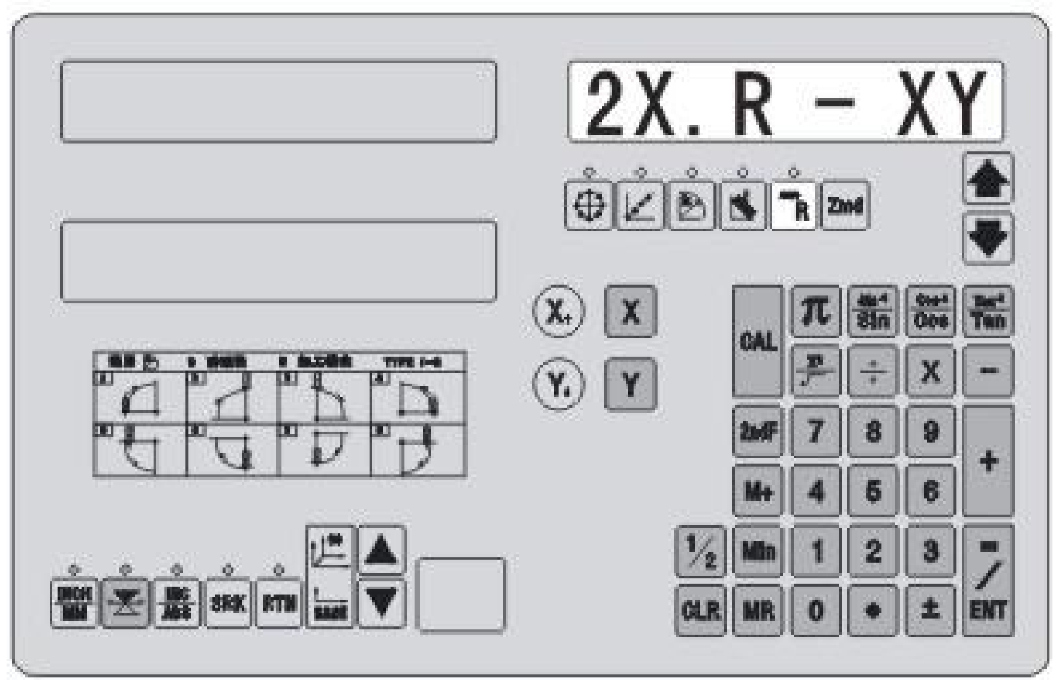




enter R function

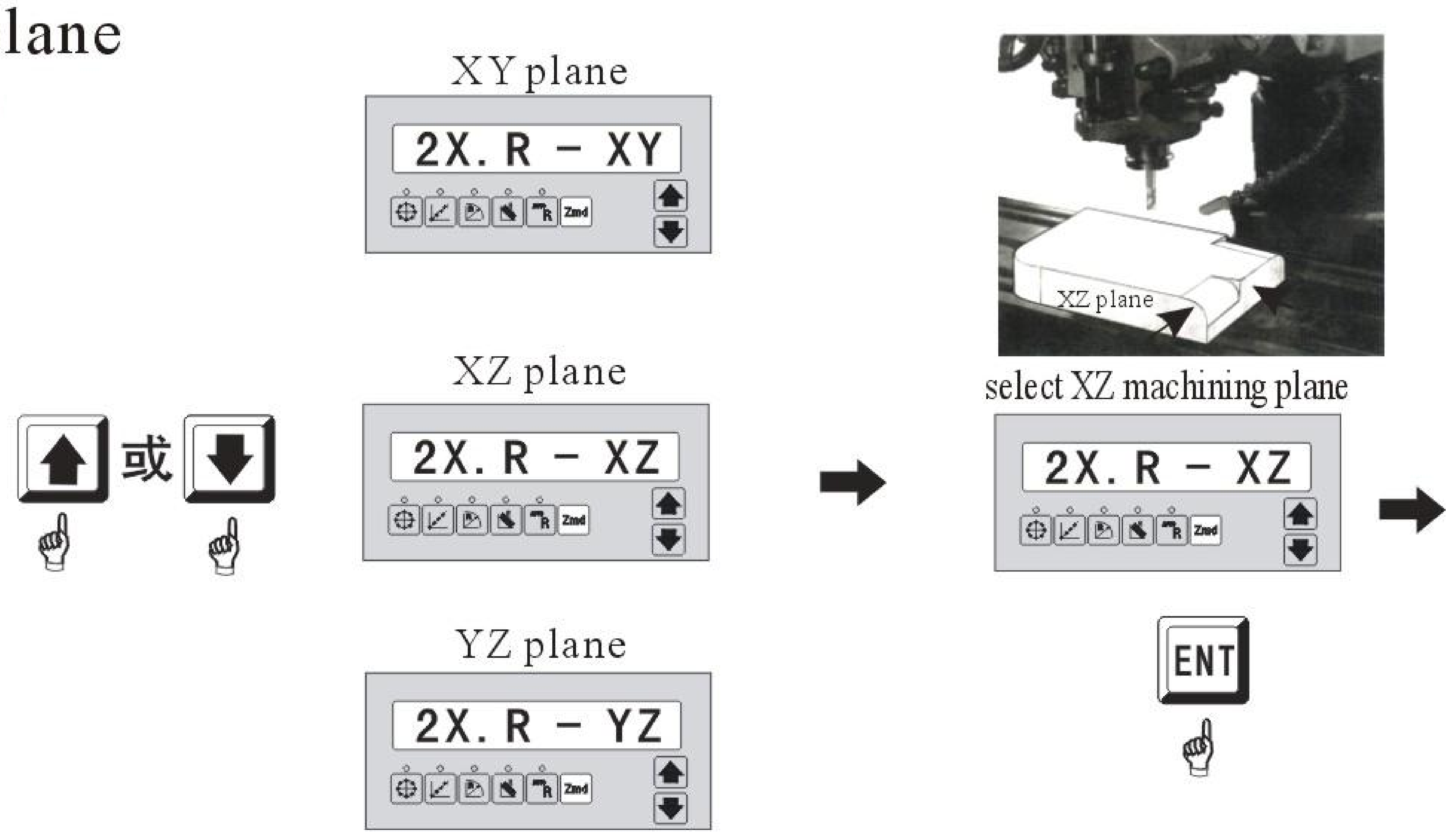


please select machining plane



R function

Step 1: select XZ plane
(2X.R-XZ)

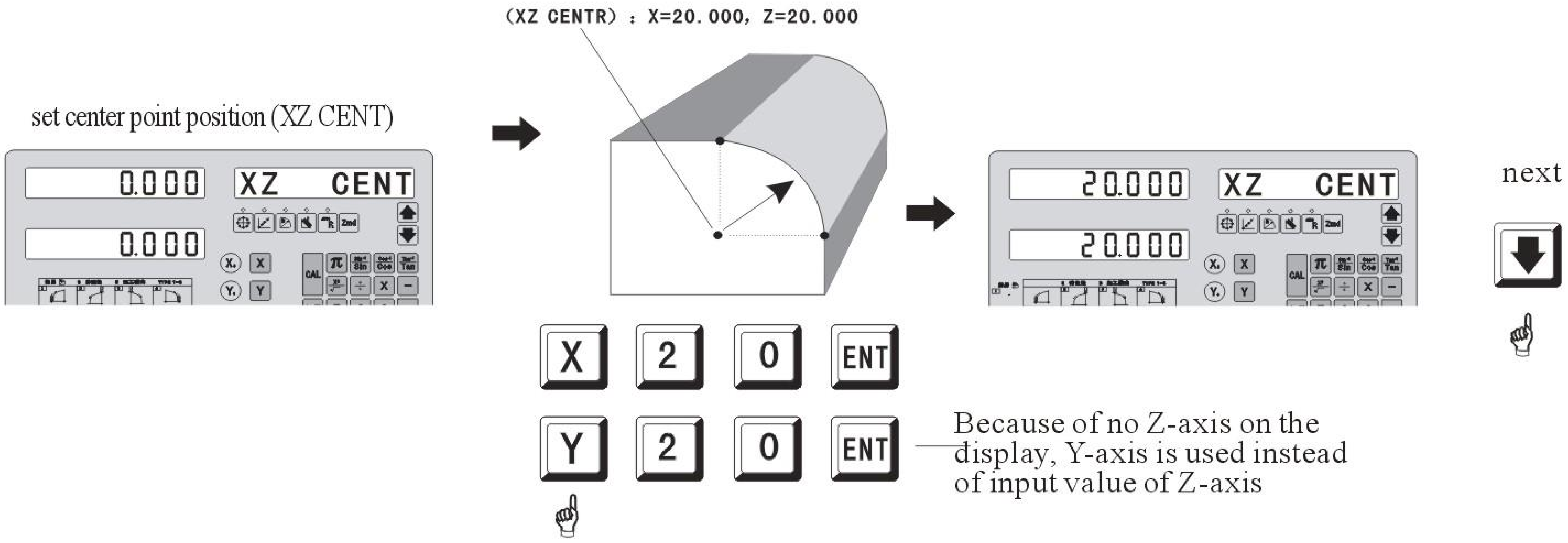


select XZ machining plane

Step 2: set center point position (XZ CENT)

(XZ CENTR) : X=20.000, Z=20.000

set center point position (XZ CENT)

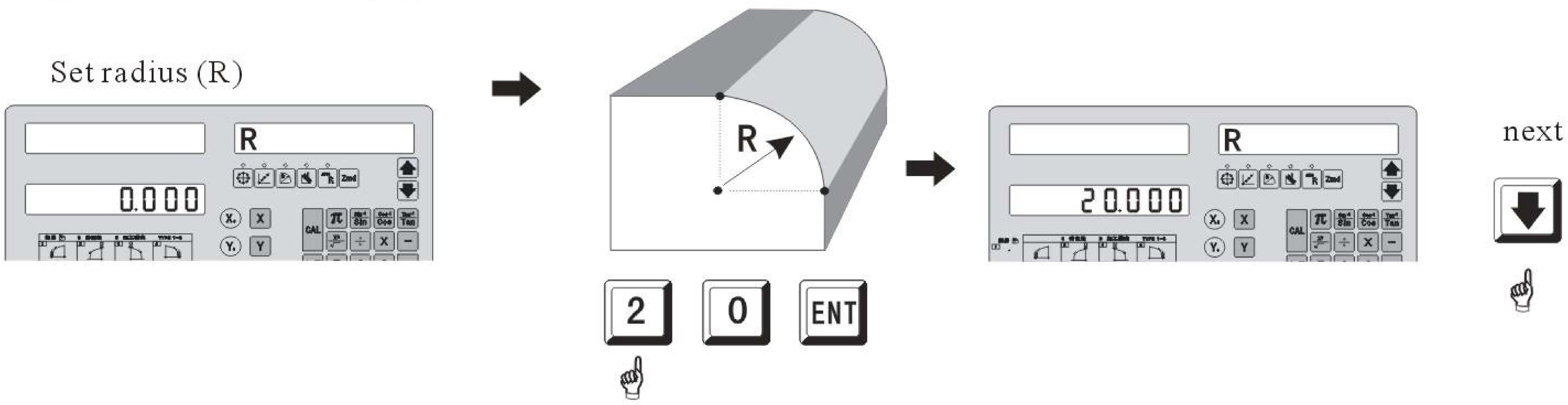


Because of no Z-axis on the display, Y-axis is used instead of input value of Z-axis

Step 3: set radius (R)

(R) =20mm

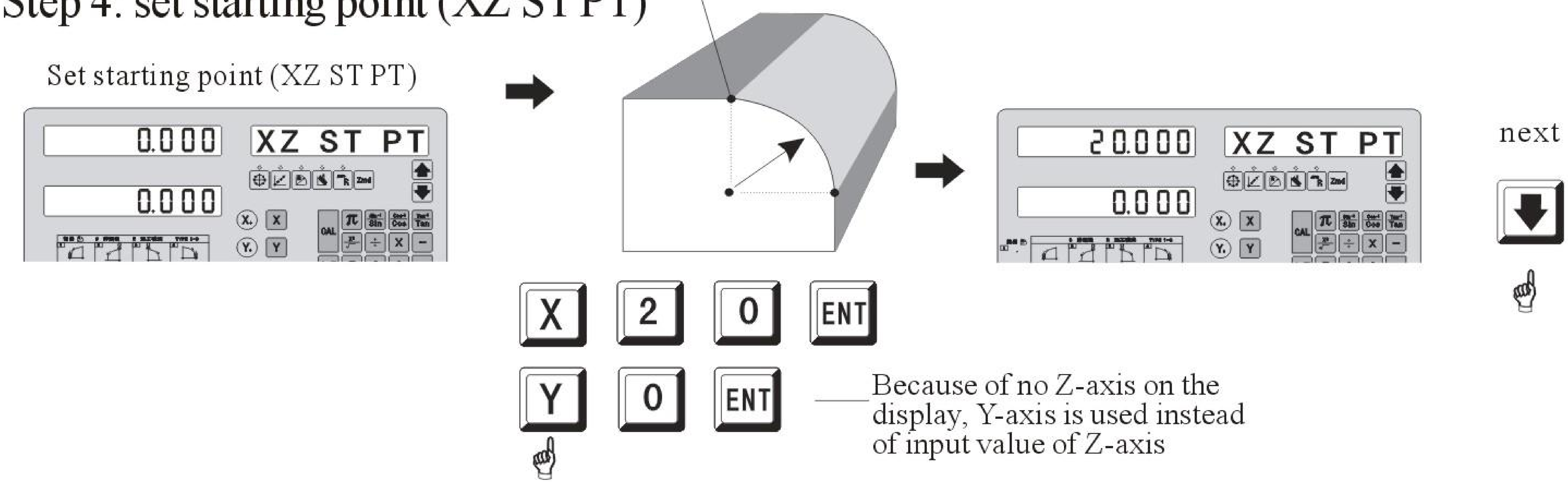
Set radius (R)



Step 4: set starting point (XZ ST PT)

(XZ ST PT) =X=20.000, Z=0.000

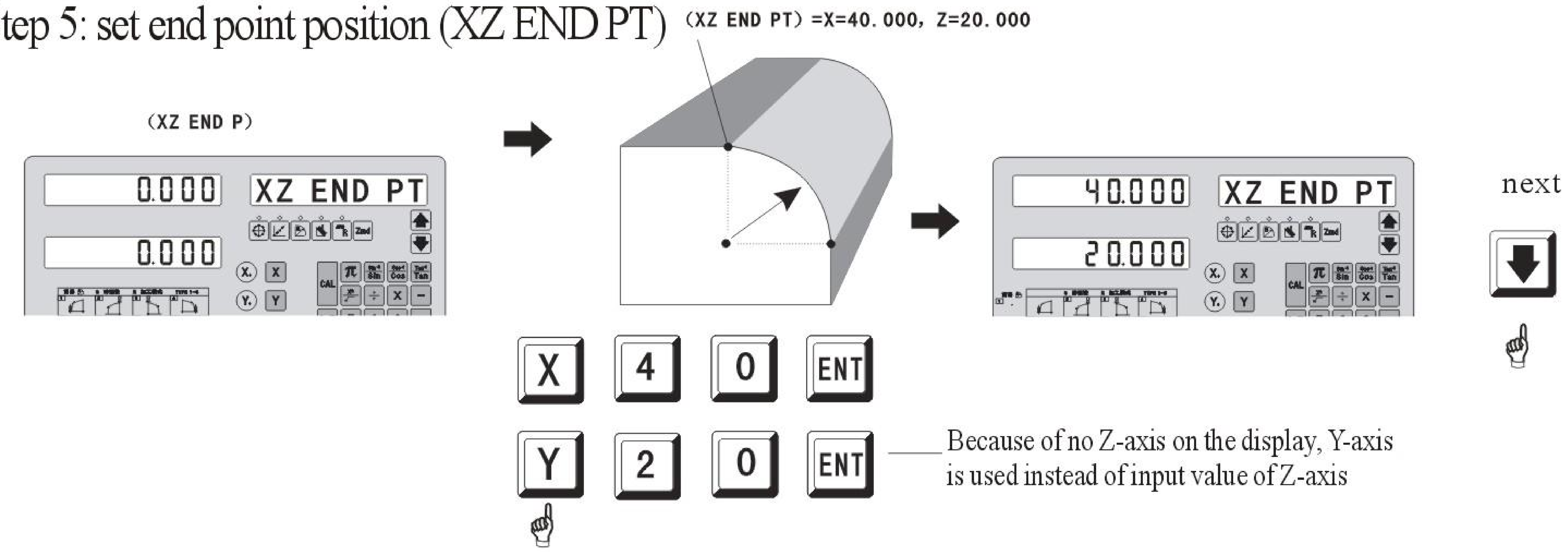
Set starting point (XZ ST PT)



Because of no Z-axis on the display, Y-axis is used instead of input value of Z-axis

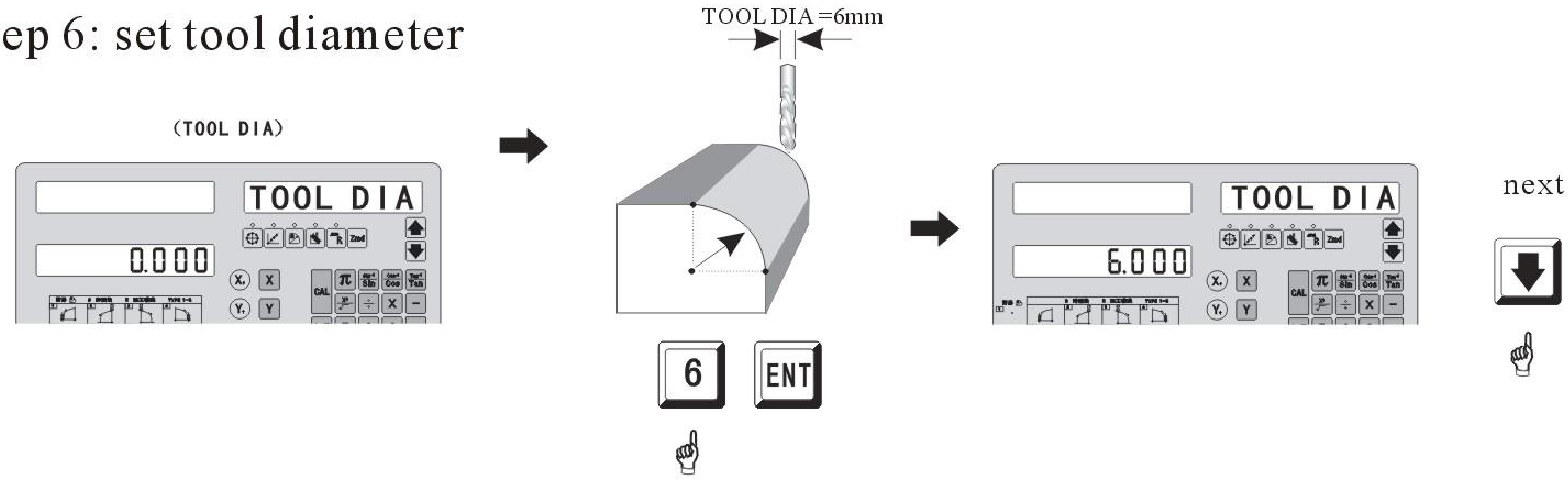
R function

Step 5: set end point position (XZ END PT)

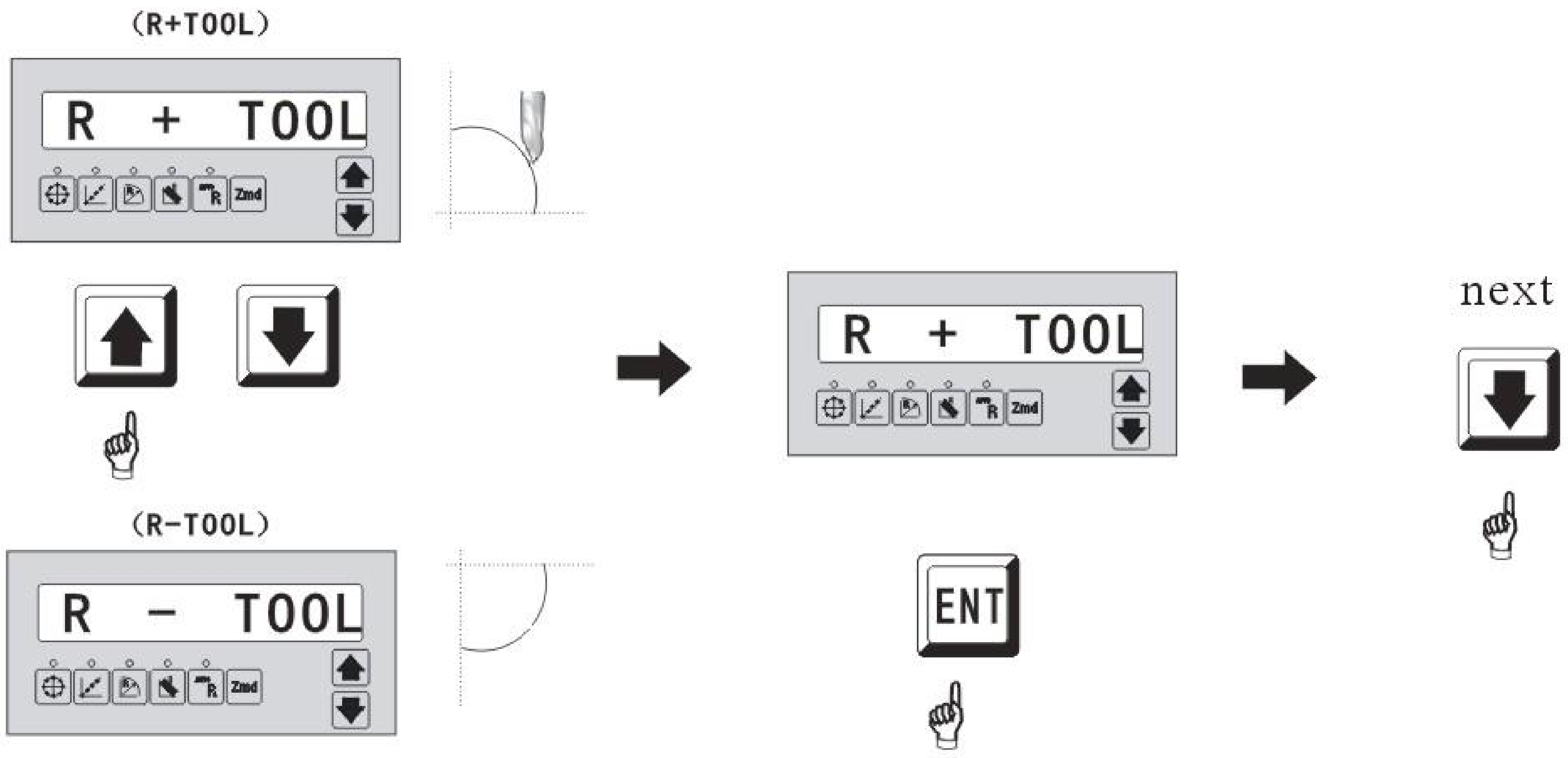


Because of no Z-axis on the display, Y-axis is used instead of input value of Z-axis

Step 6: set tool diameter



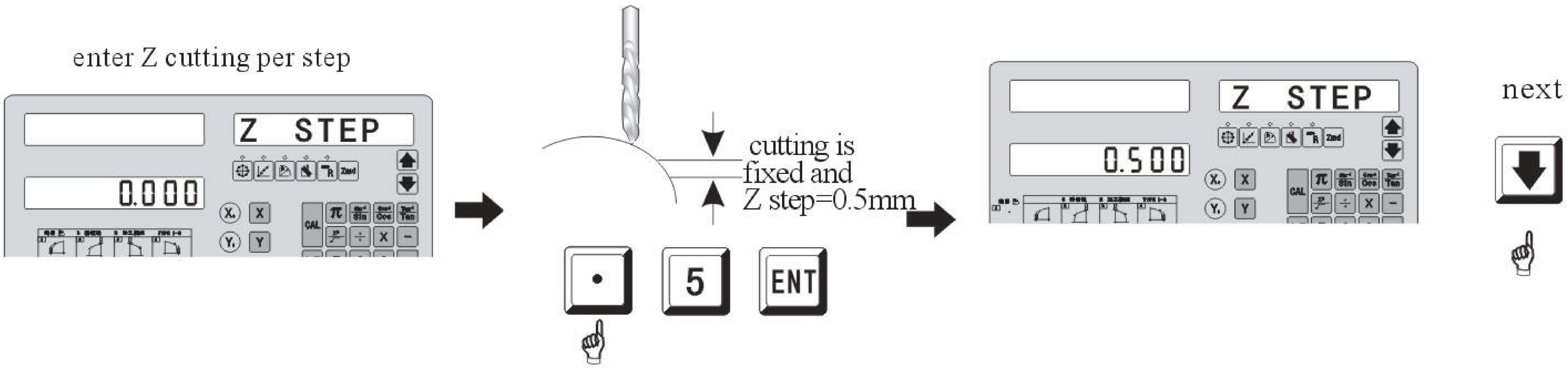
Step 7: set tool compensation direction



Step 8: set cutting per step distance

For digital display has advanced calculus function-smooth R function, it can help operator calculate the best cutting step and simply fix the cutting of Z per step to adapt to different requirements.

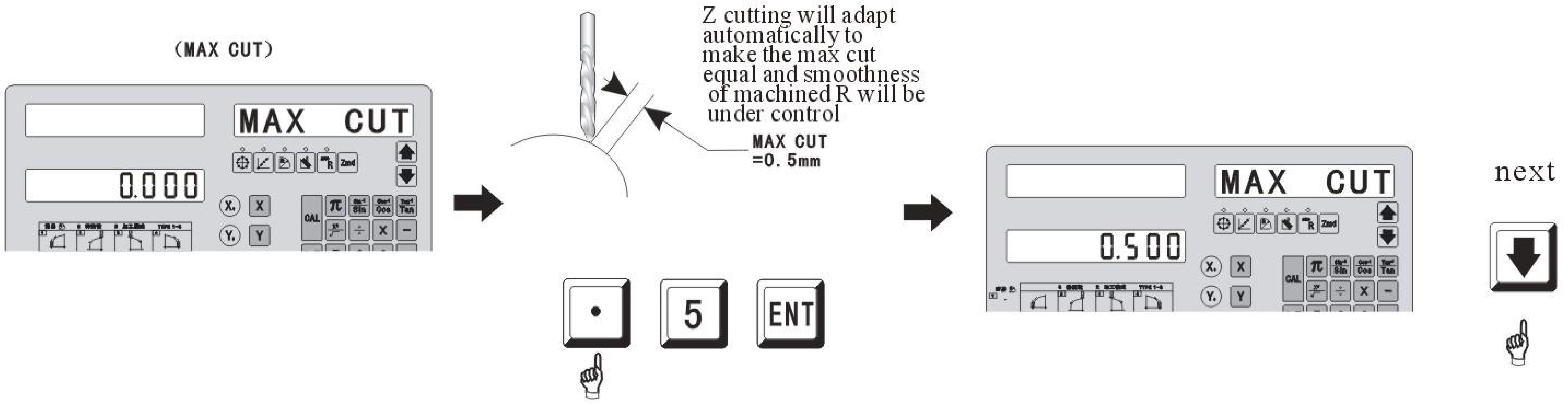
When operator selects fixed Z step, the state is in the following:



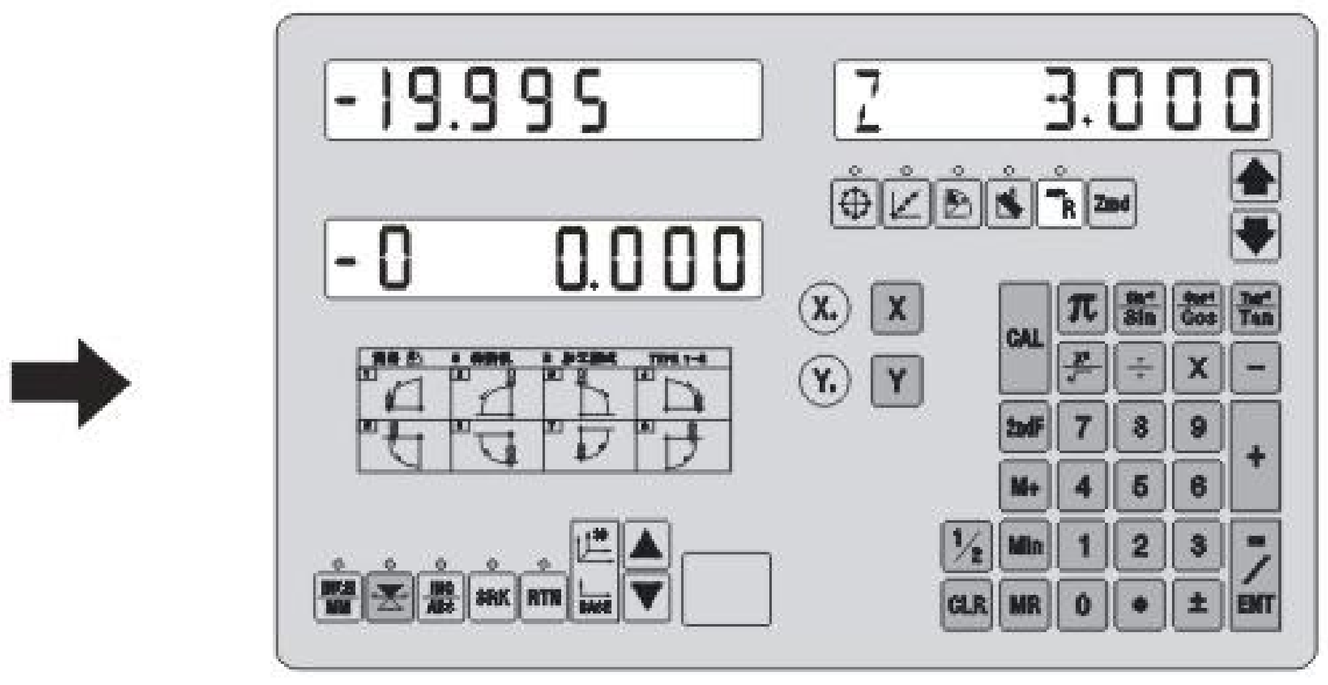
cutting is fixed and Z step=0.5mm

R function

When operator selects smooth R function (MAX CUT), the state is in the following:


(MAX CUT)
MAX CUT
0.000
Z cutting will adapt automatically to make the max cut equal and smoothness of machined R will be under control
MAX CUT =0. 5mm
•
5
ENT
MAX CUT
0.500
next

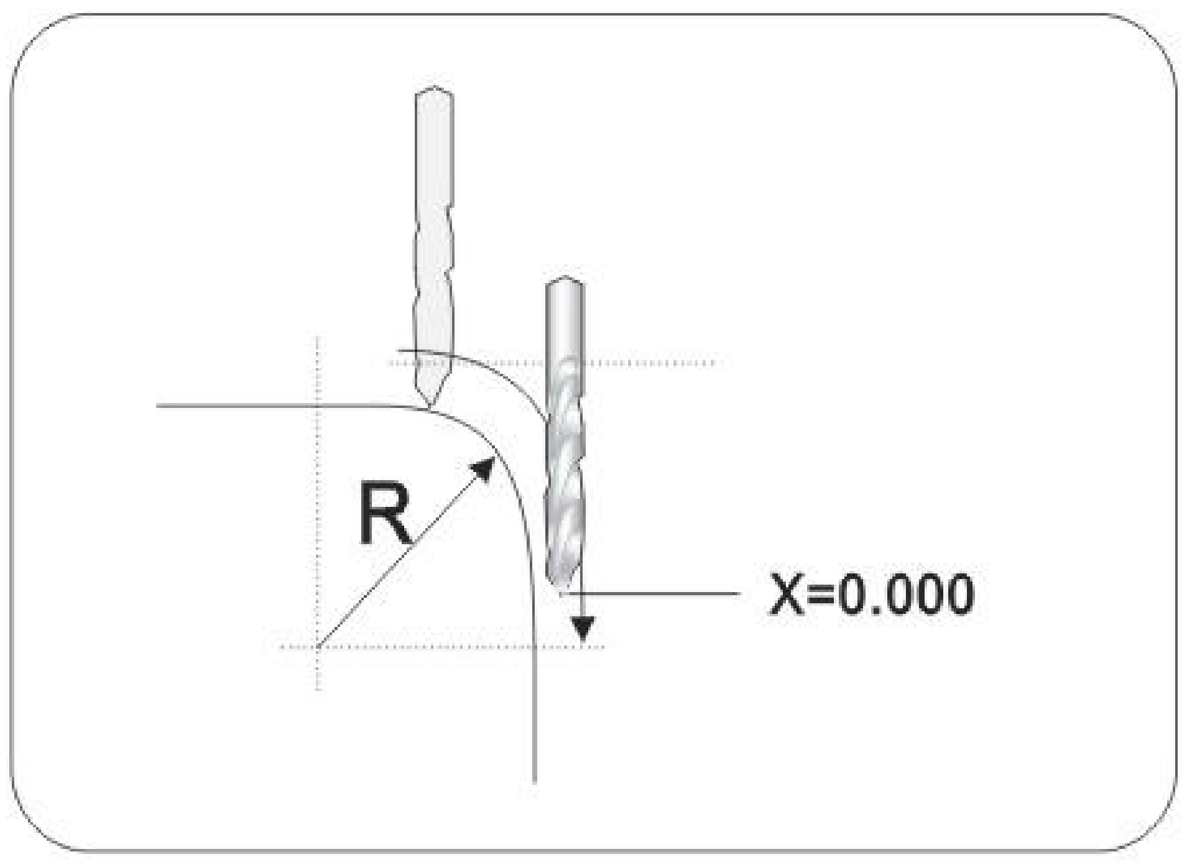
After all the parameters of R function has been set, enter the machining state.



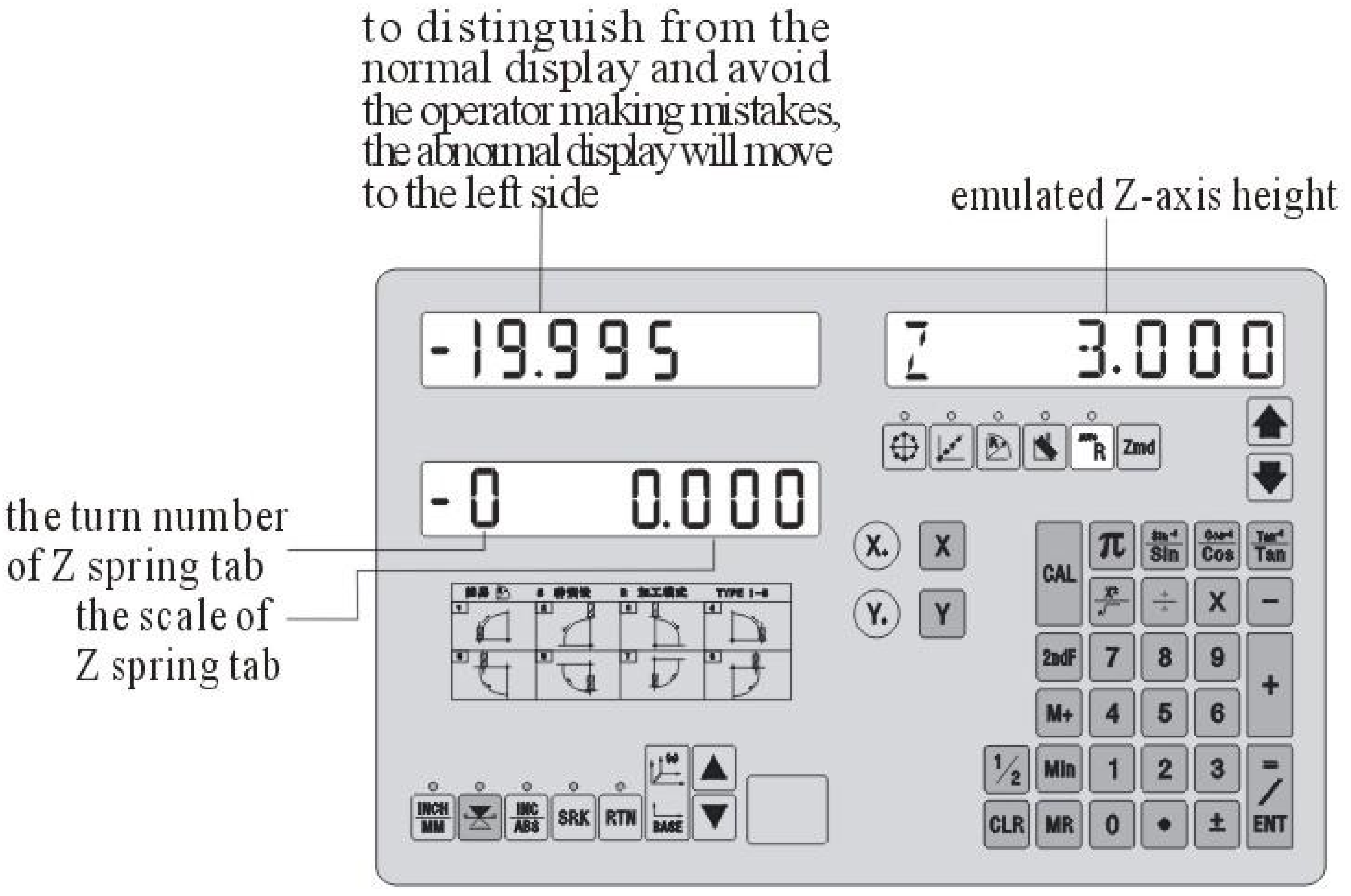
Because two axes digital displaydoes not have Z axis, use ⬆ and ⬇ to simulate Z axis. ⬆ simulates Z axis UP one step. ⬇ Simulates Z axis DOWN one step. Before the start of ARC cutting, please make sure the tool is posited at the starting point of R and Z axis dial is set to zero.

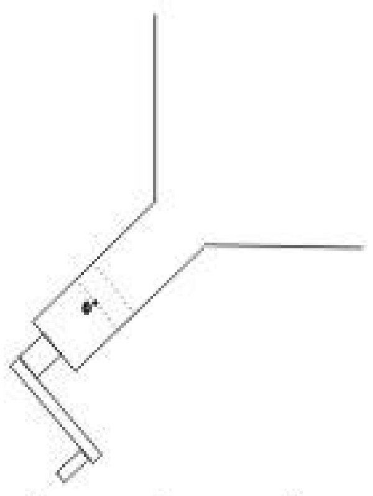
Display and operation of two-axis display under R function:

Since no Z axis on the bi-axis digital display, it has to display the spring tab scale and its turn number of Z-axis in the way of emulation on the unoccupied axis. In the course of working, the initial point height of R on Z-axis is set as '0.000'. And in the working course of R machining processing, the spring tab scale and its turn number are automatically transformed from the current machining height of Z-axis, which will lead operator to complete the R processing easily.



move the machine tool to the position of X=0.000 and this height is inclined plane Z height.


to distinguish from the normal display and avoid the operator making mistakes, the abnormal display will move to the left side
emulated Z-axis height
the turn number of Z spring tab
the scale of Z spring tab
-19.995
Z 3.000
-0 0.000

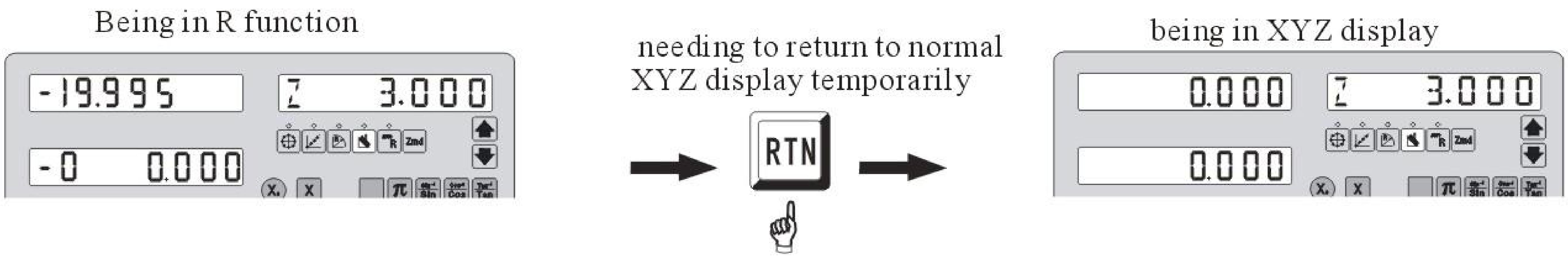


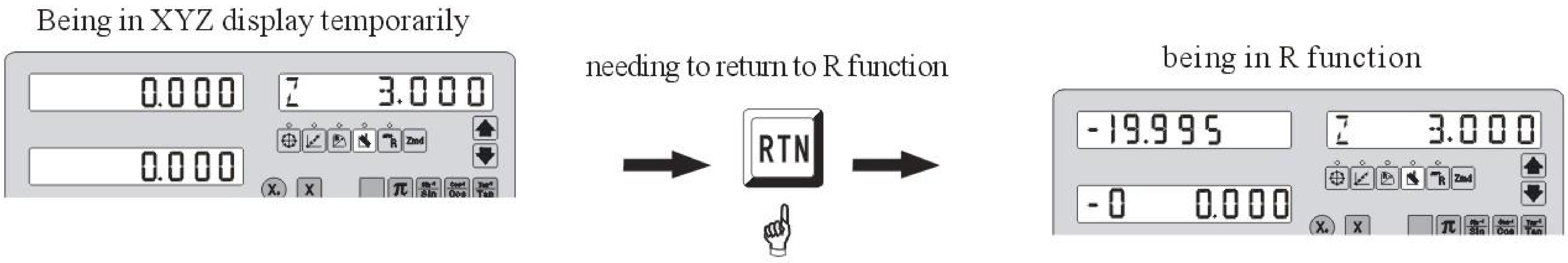
Z-axis spring tab set as 0

R function

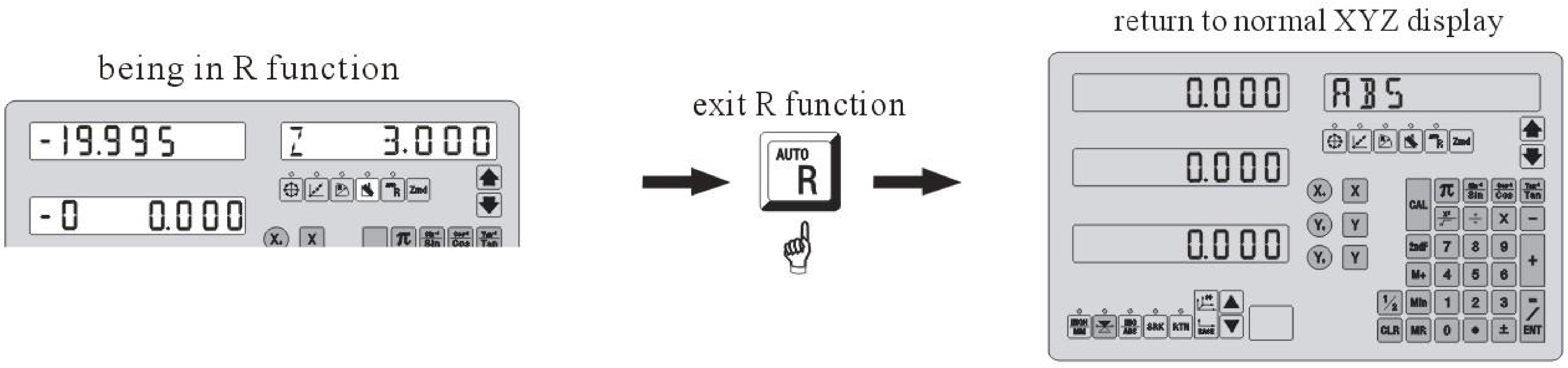
If Z-axis is beyond R scale, Z-axis will display 'ZOU LI'.

Anytime if the user wants to return normal XYZ to check the position calculated by the digital display, user can temporarily exit ARC mode.




Being in XYZ display temporarily
0.000
Z 3.000
0.000
needing to return to R function
RTN
being in R function
-19.995
Z 3.000
-0 0.000

Finish ARC cutting mode and return normal mode.



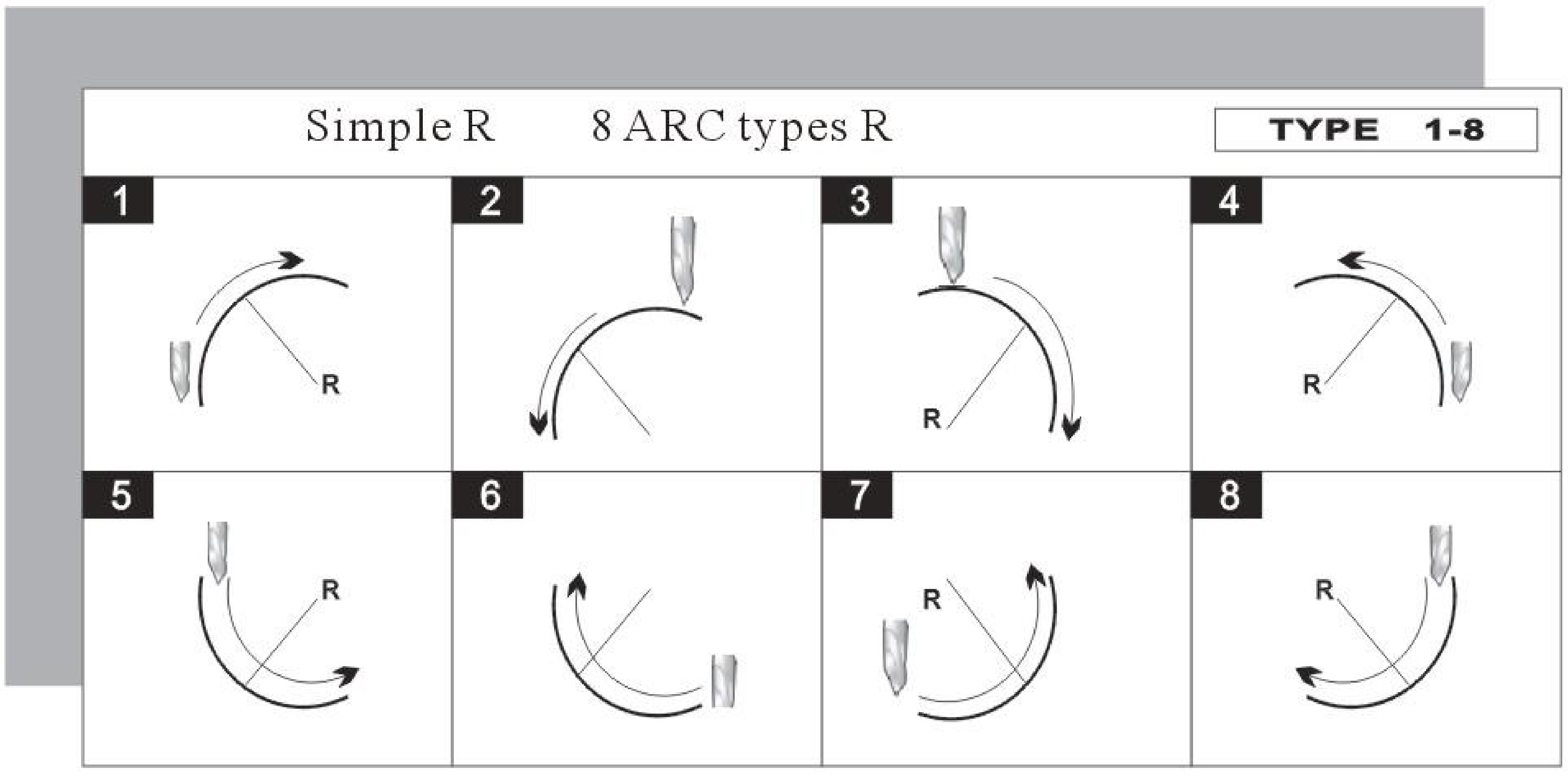
Note: the above is operating instructions of R function on two-axis digital display. R function of three-axis display: except XY cutting plane, XZ and YZ need not input cutting step, as well as press ⬆ or ⬇ . Select cutting step and move Z-axis of grating directly, i.e. the cutting step of Z-axis. The coordinate of X or Y will change with cutting step and move the value to 0.000, i.e. the position of machining.

Simple R function

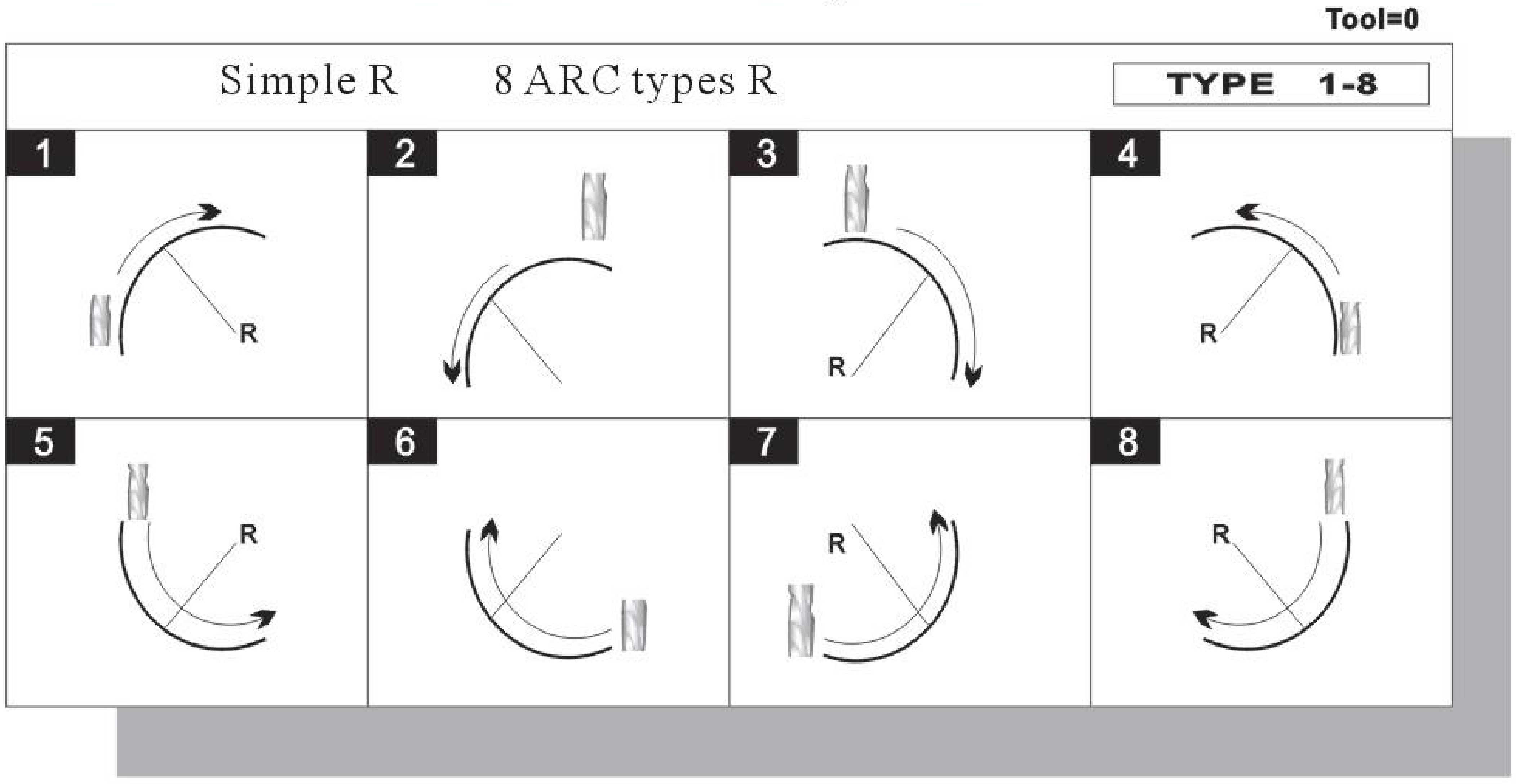
Simple R function :

In most cases, only 8 types of arc are used to the machining cutting. Therefore, simple R provides the following 8 types of machining mode.

Using ball nose slot drill to process machine cutting on XZ/YZ plane

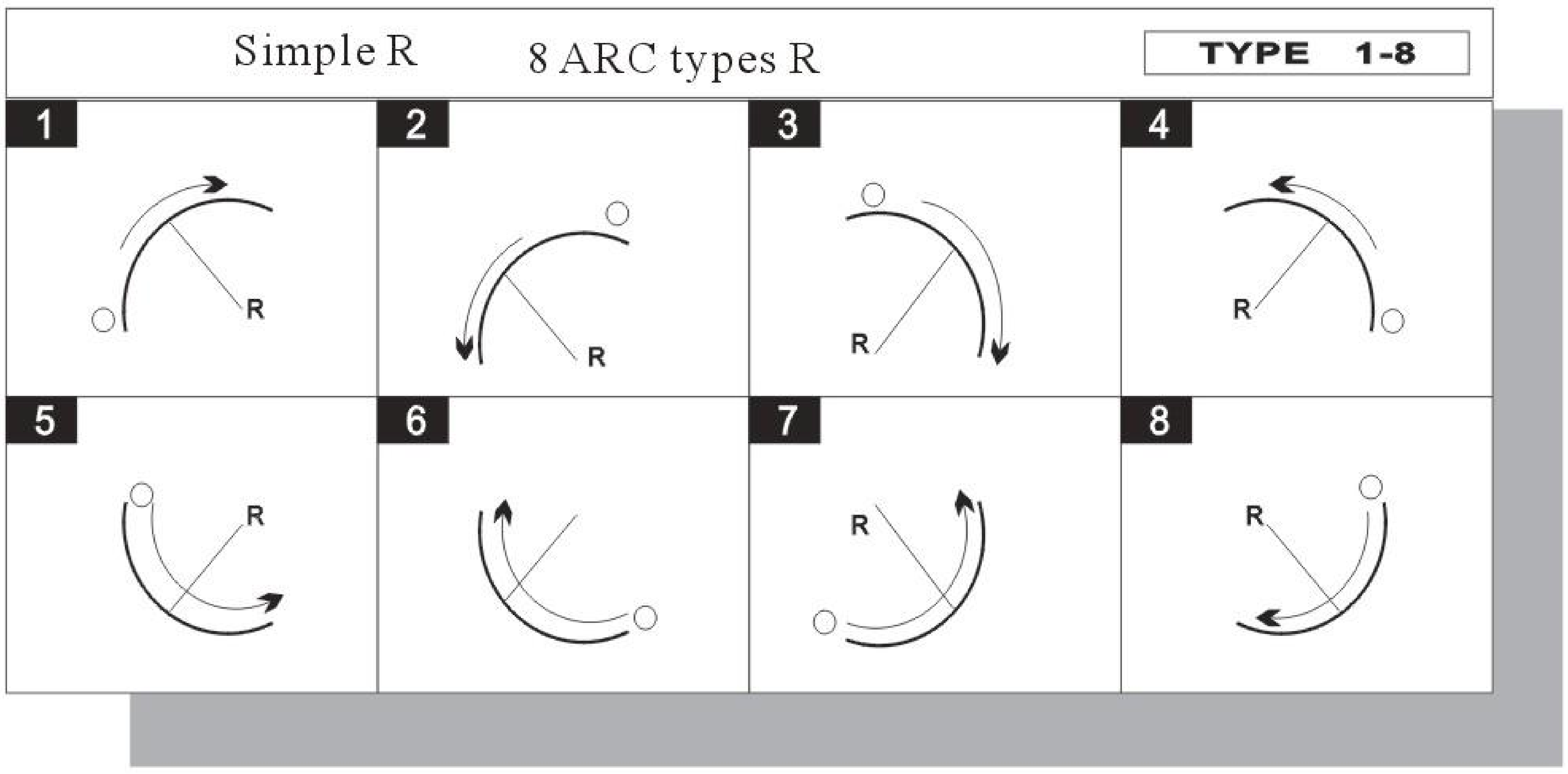


Using 4 flute end drill to cut XZ/YZ plane R



Notice:since processing R should be dealt with the tip, the tool diameter should be set as 0.000.

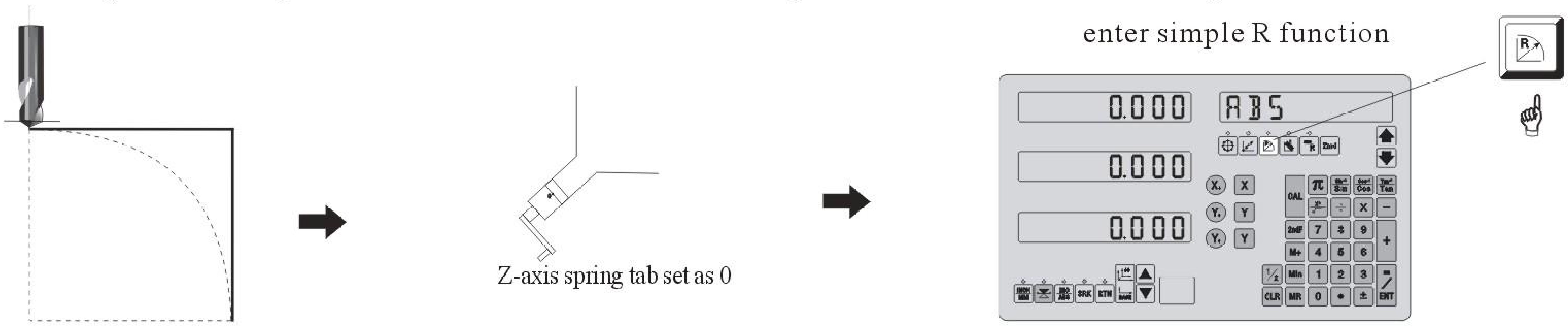
Using two flute (slot drill) for XY plane R



Simple R function

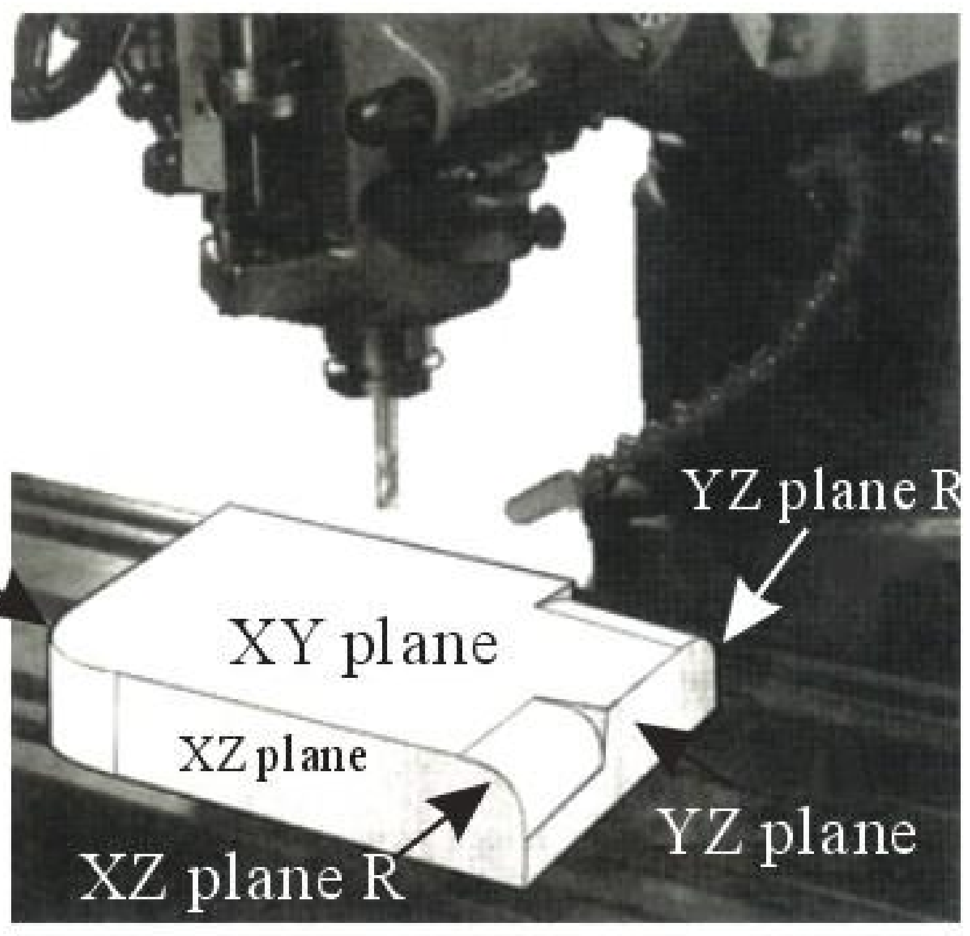
For using Simple R function, the following cutting parameters are needed.

Clamp the workpiece on the machine tool and posit the tool to the start-point of R.

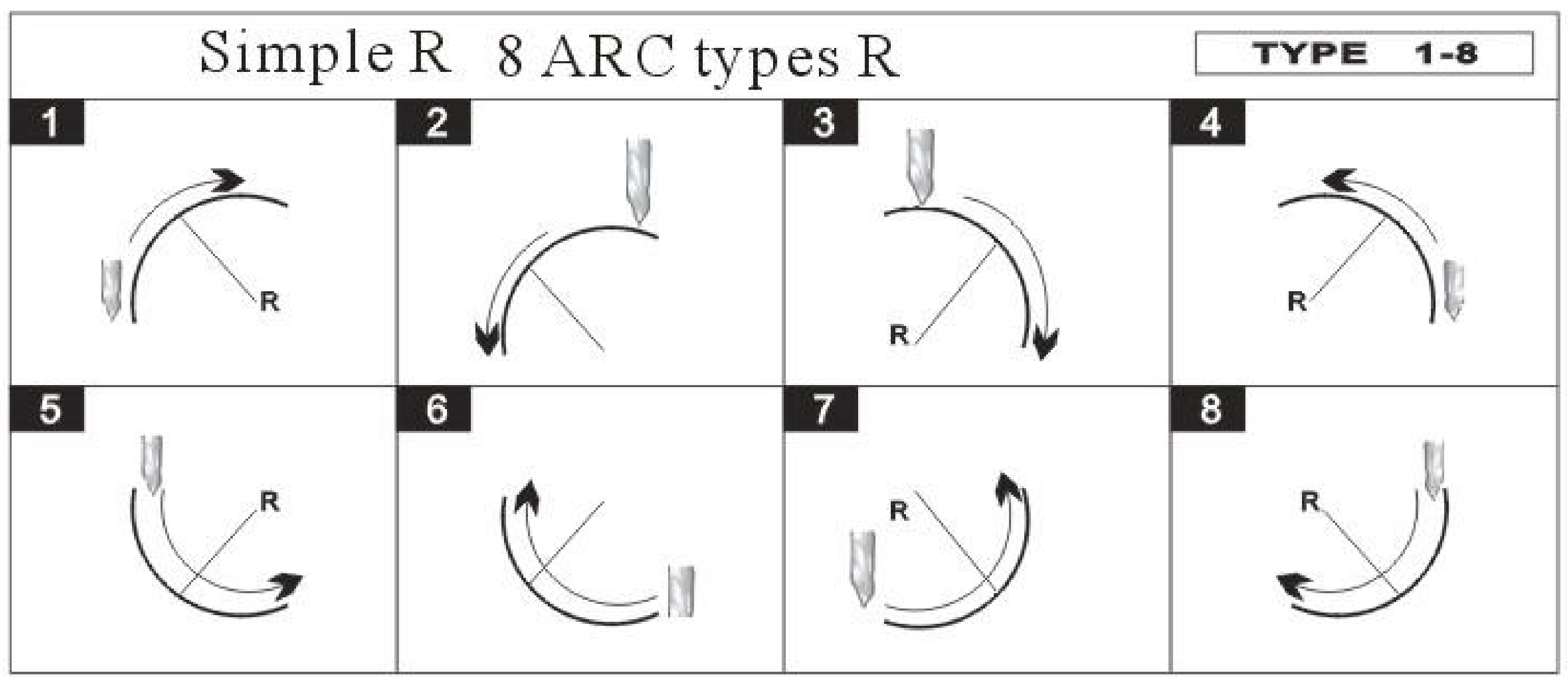


Input the following data.

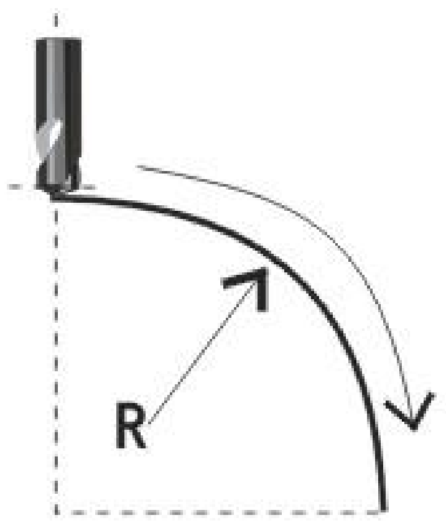
1 select XY/XZ/YZ cutting plane



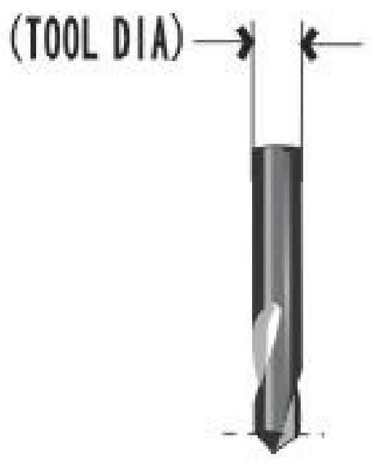
2 ARC types (1-8)



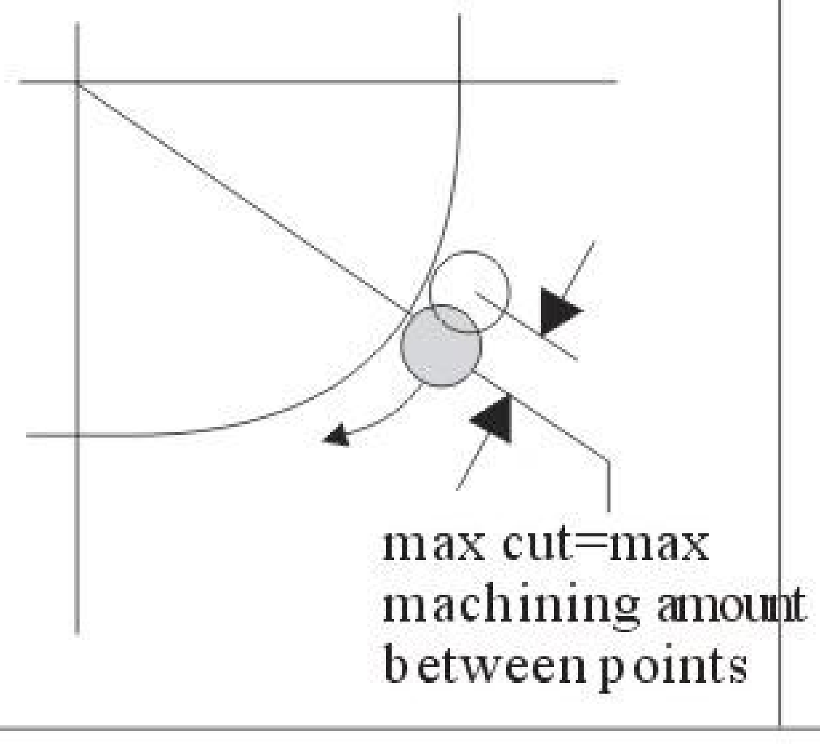
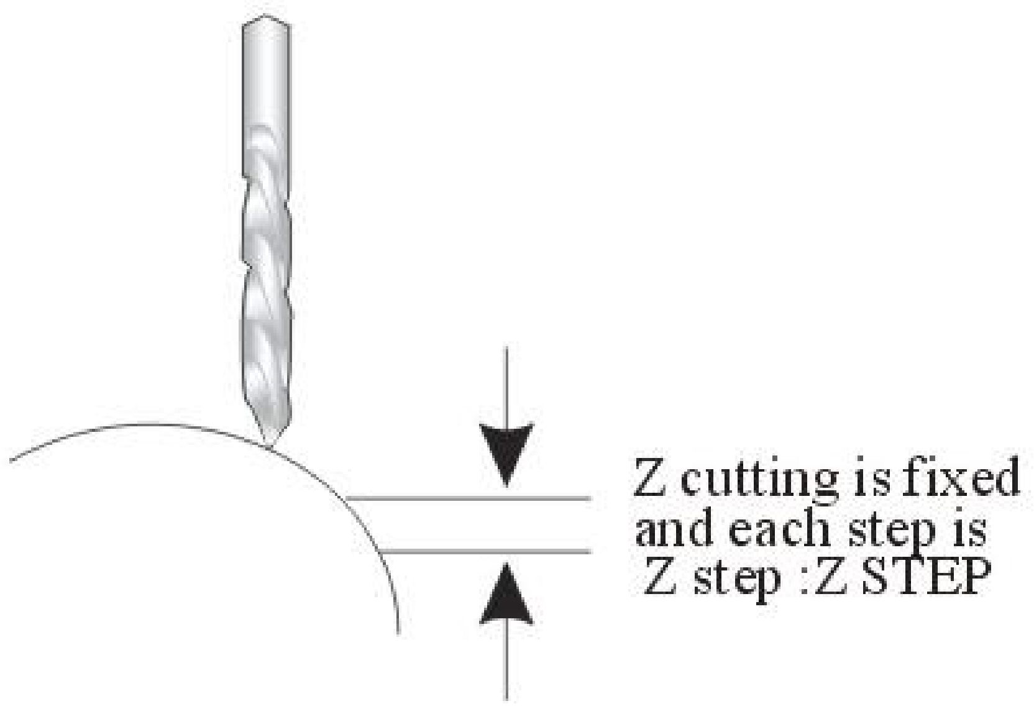
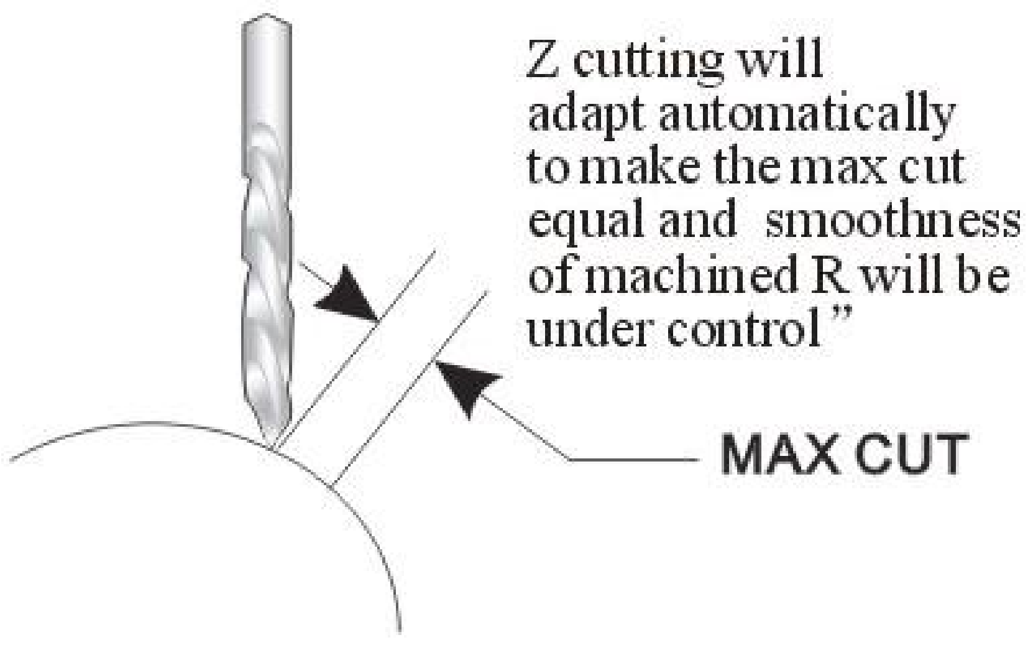
3 radius



4 tool diameter



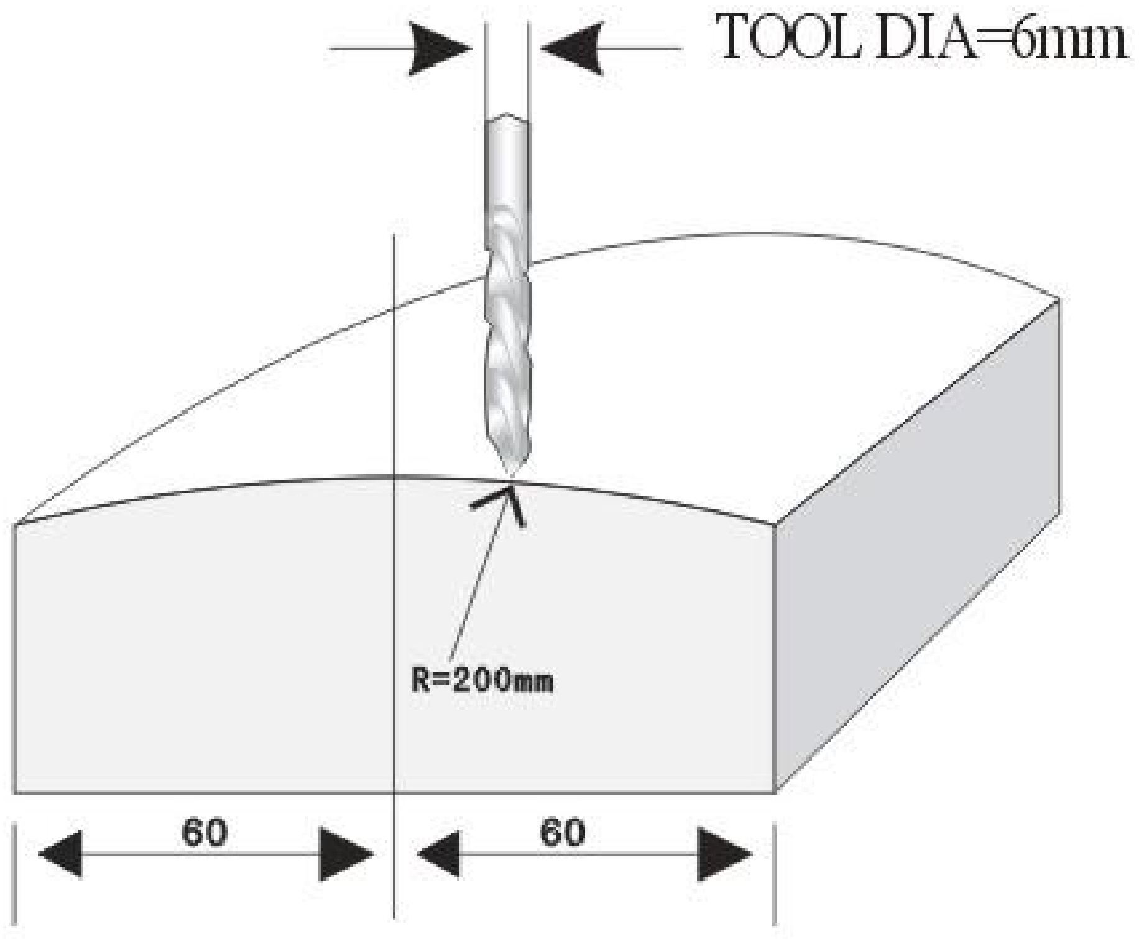
5 Step increment

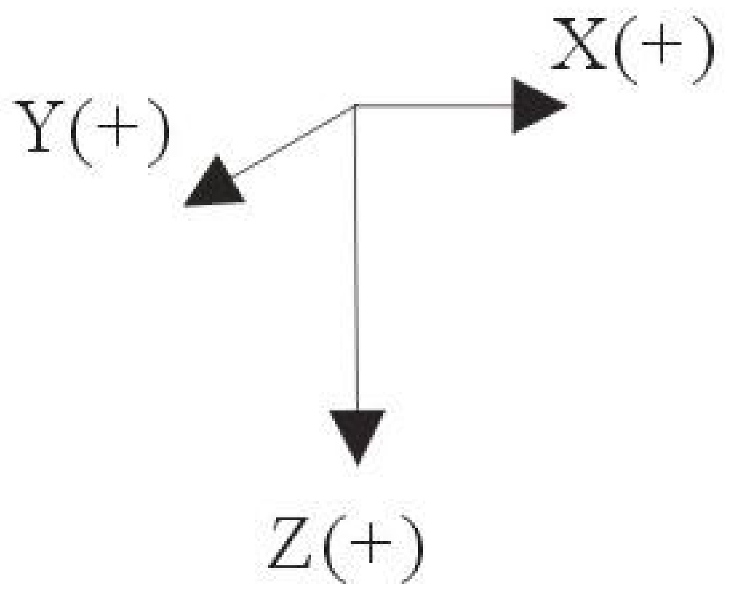
XY plane R	XZ/YZ plane R	
For XY plane R, distance between interpolated points is to be specified as the machining step increment.  	usually the cutting step of each point is each Z step  	under smooth R function, cutting of each point is max cut  Z cutting will adapt automatically to make the max cut equal and smoothness of machined R will be under control" MAX CUT

Simple R function

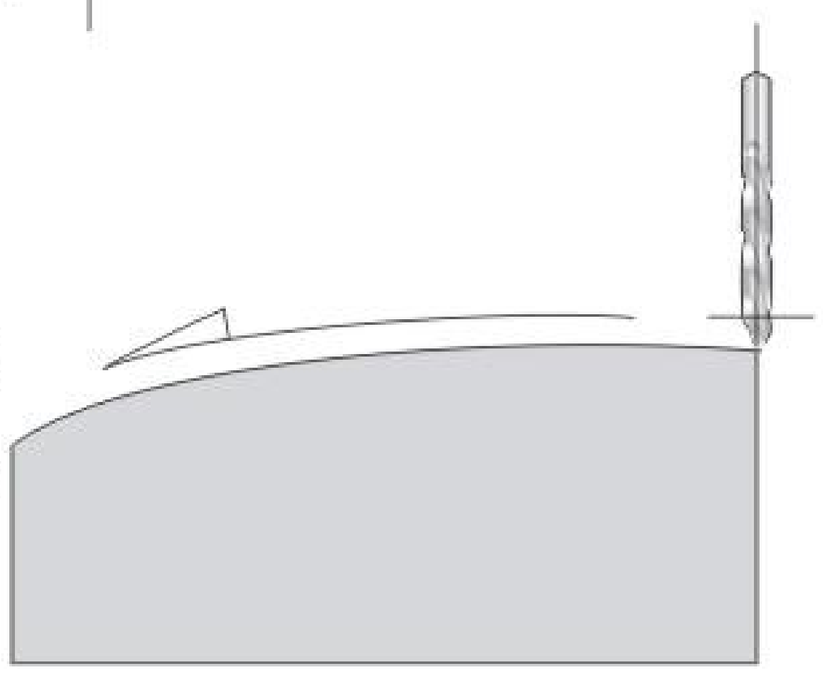
Example 1

Cutting a workpiece R=200mm on the XZ plane

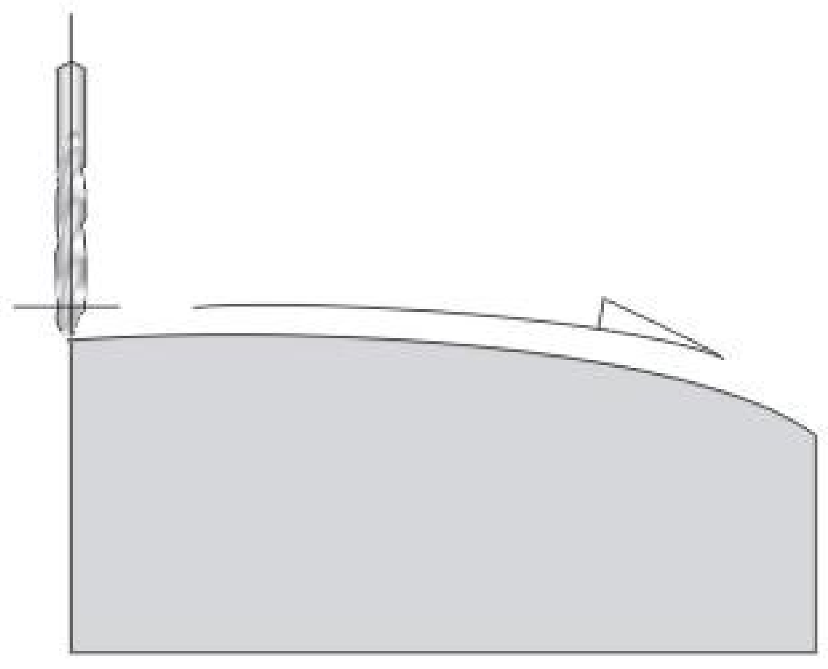




Share cutting into two parts to cut this R (simple 8 types only valid for quarter circle)

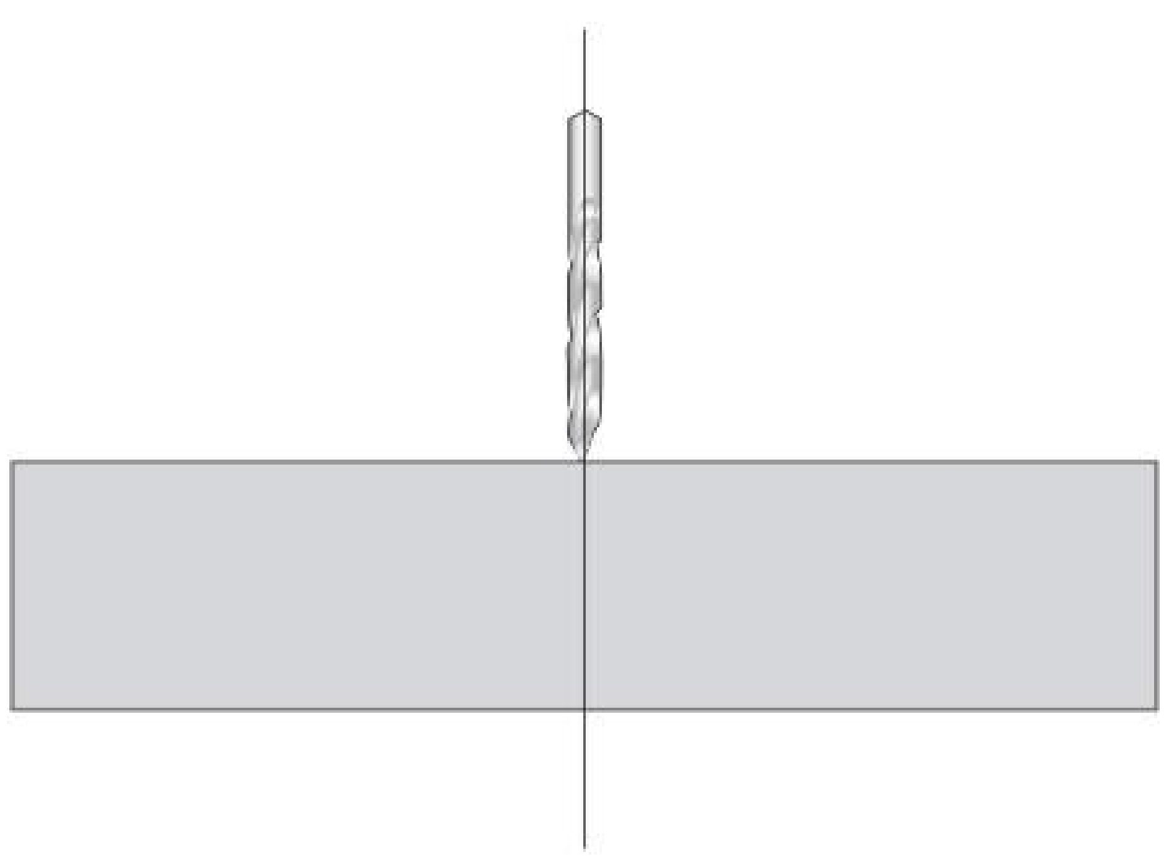


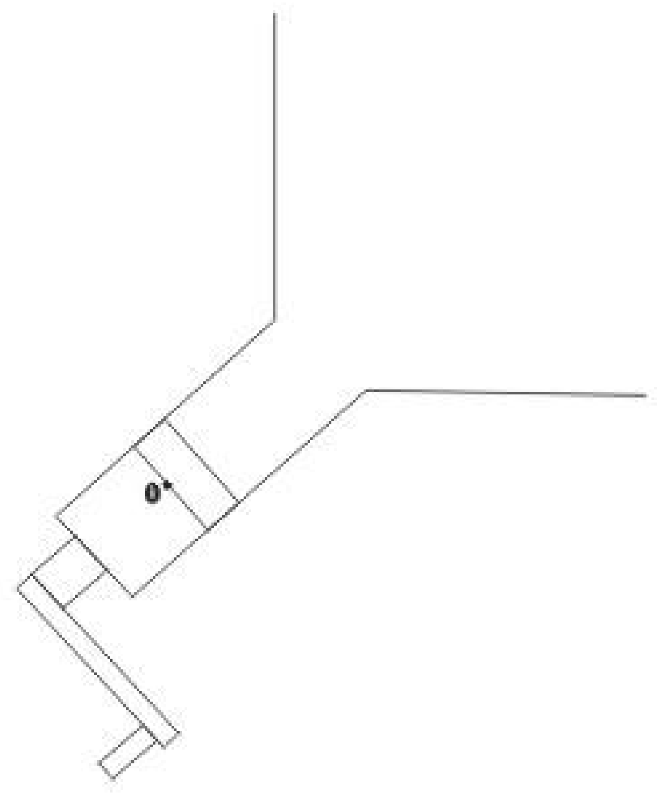
One part using ARC types 2



the second part using ARC type 3

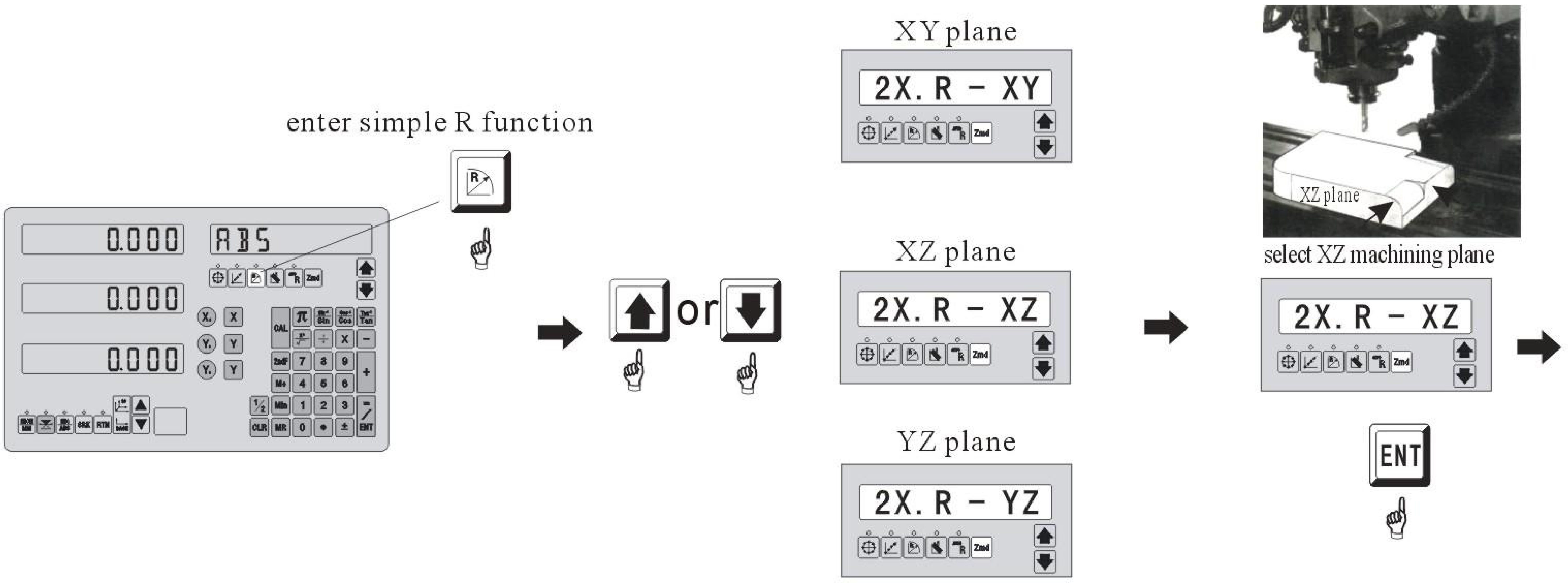
Posit the tool at the R starting point. Set the Z dial to zero.





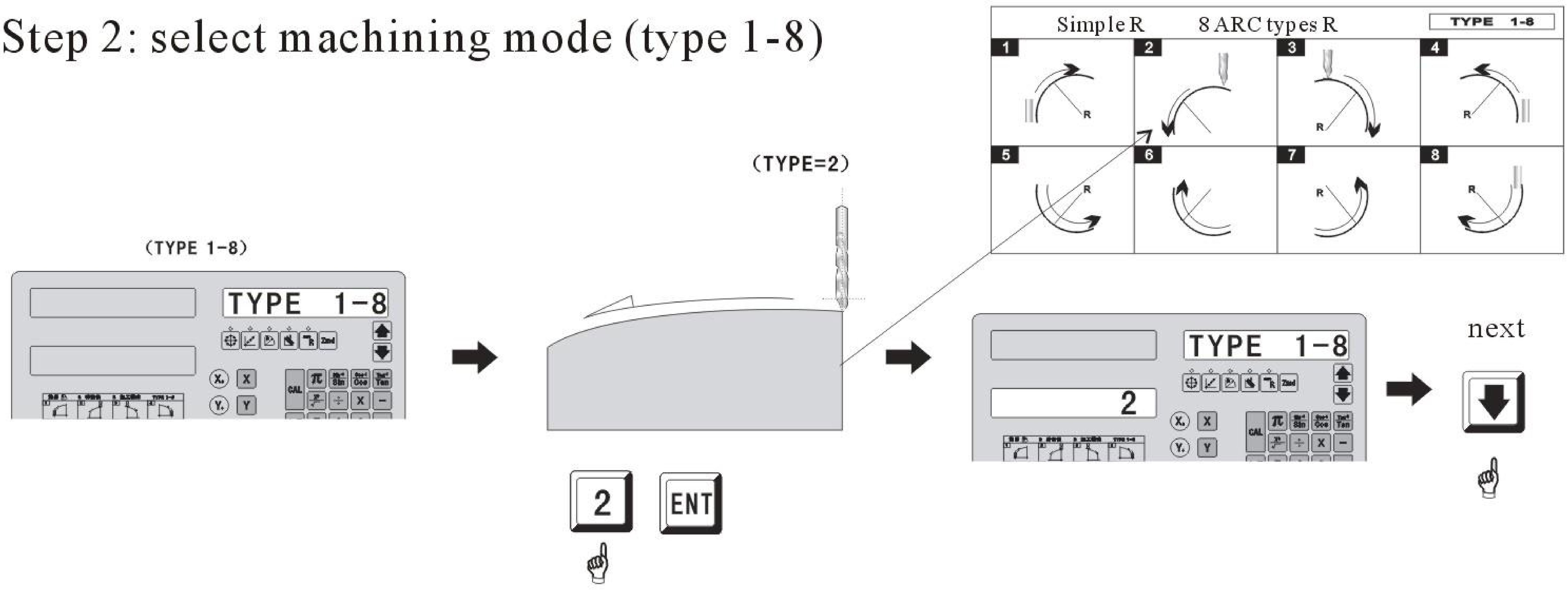
machine tool Z-axis spring tab set as 0.00

Step 1: select XZ plane R

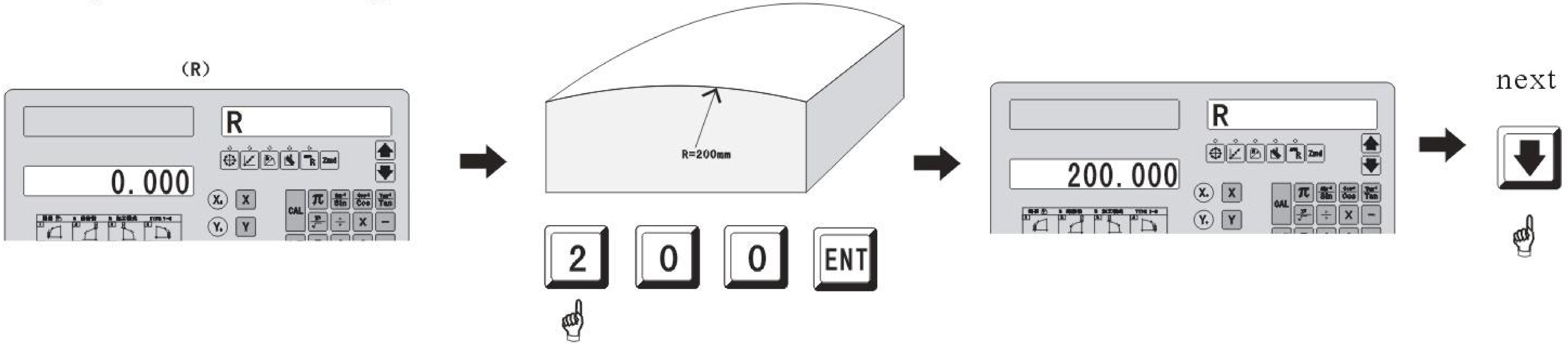


Simple R function

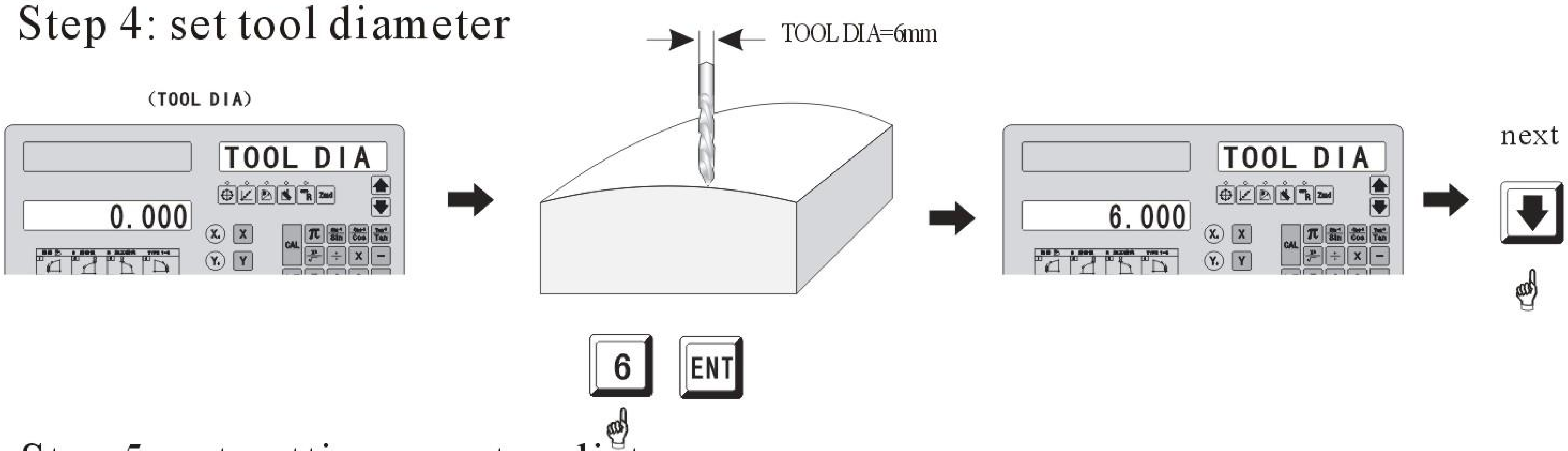
Step 2: select machining mode (type 1-8)



Step 3: set cutting radius



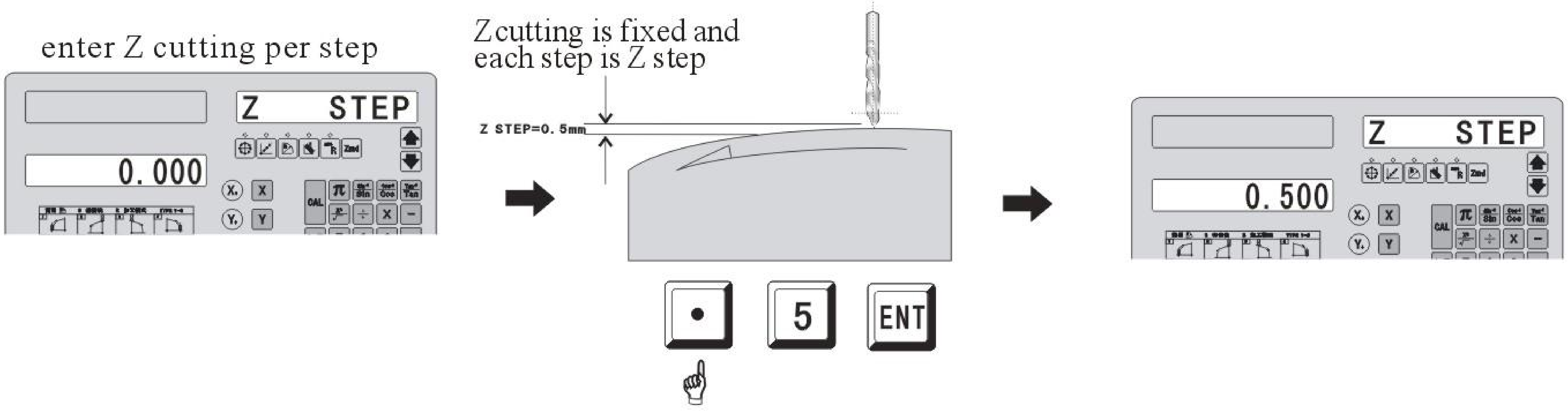
Step 4: set tool diameter



Step 5: set cutting per step distance

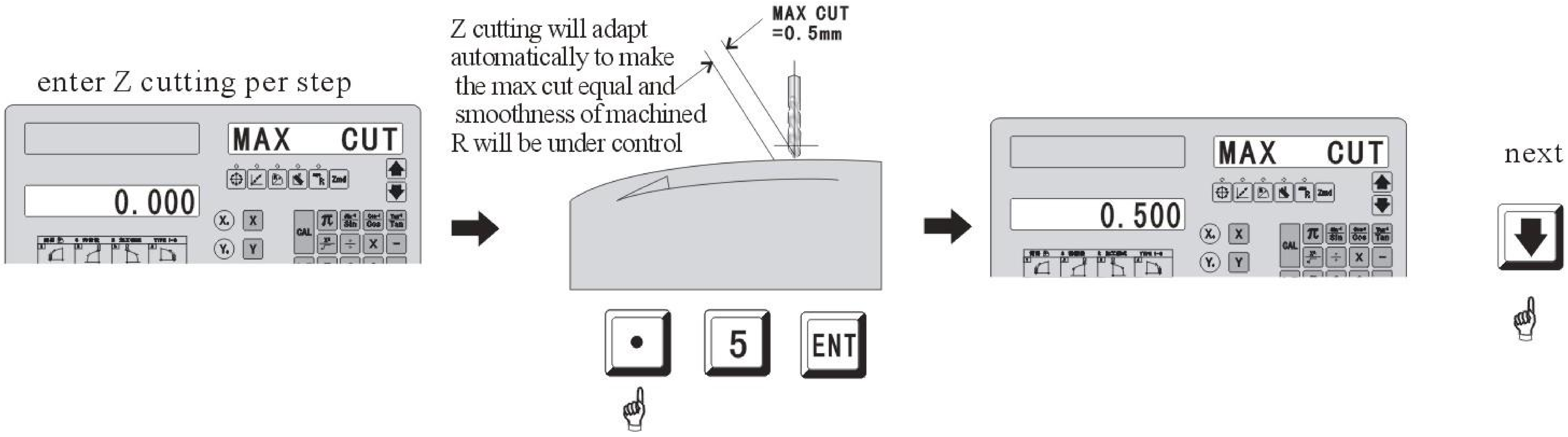
For digital display has advanced calculus function-smooth R function, it can help operator calculate the best cutting step and simply fix the cutting of Z per step to adapt to different requirements.

When operator selects fixed Z step, the state is in the following

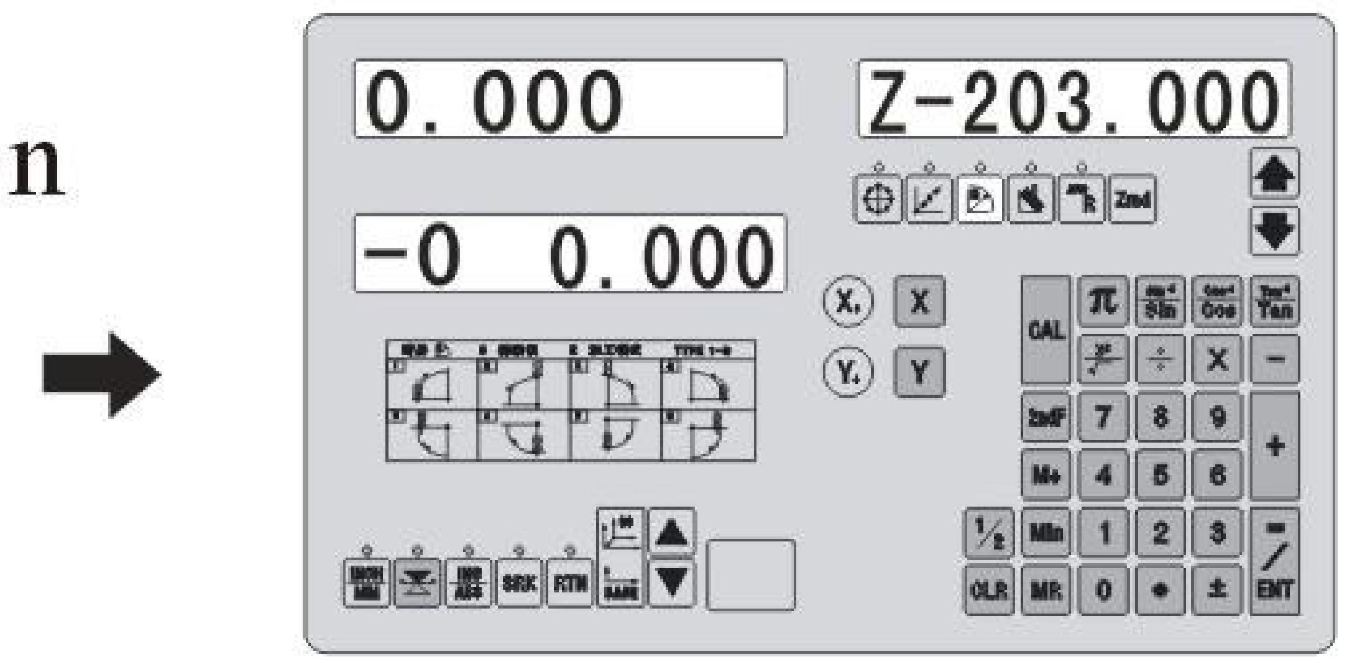


Simple R function

When operator selects smooth R function (MAX CUT), the state is in the following


enter Z cutting per step
MAX CUT
0.000
Z cutting will adapt automatically to make the max cut equal and smoothness of machined R will be under control
MAX CUT =0.5mm
•
5
ENT
MAX CUT
0.500
next

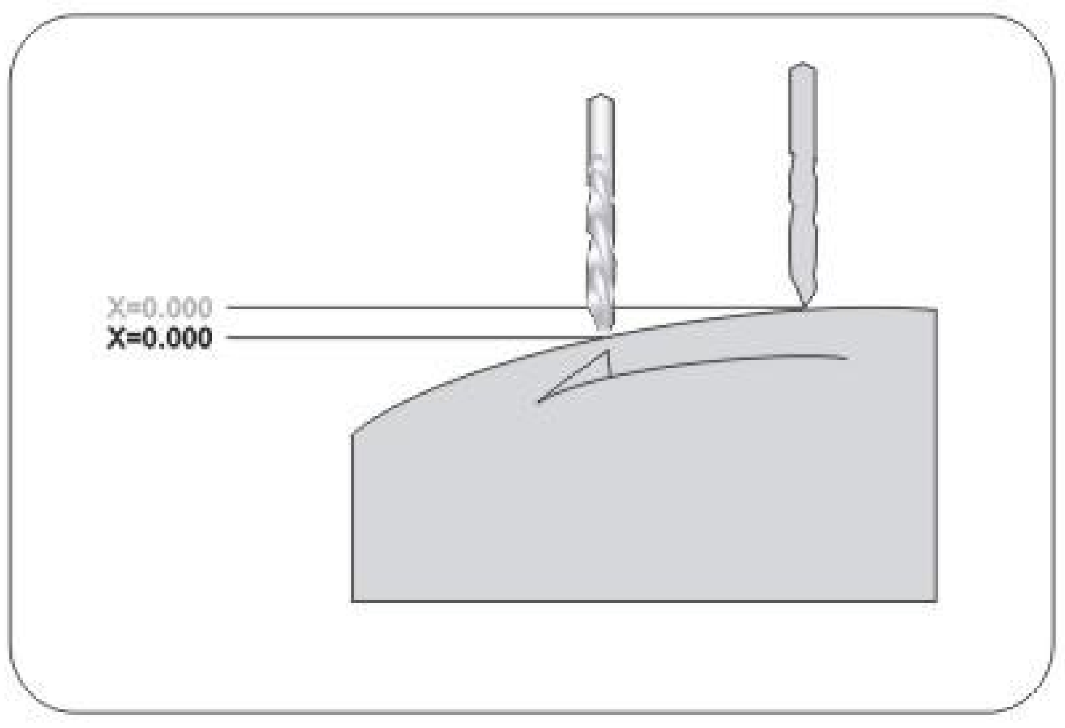
After all the parameters of simple R function has been set, enter the machining state.



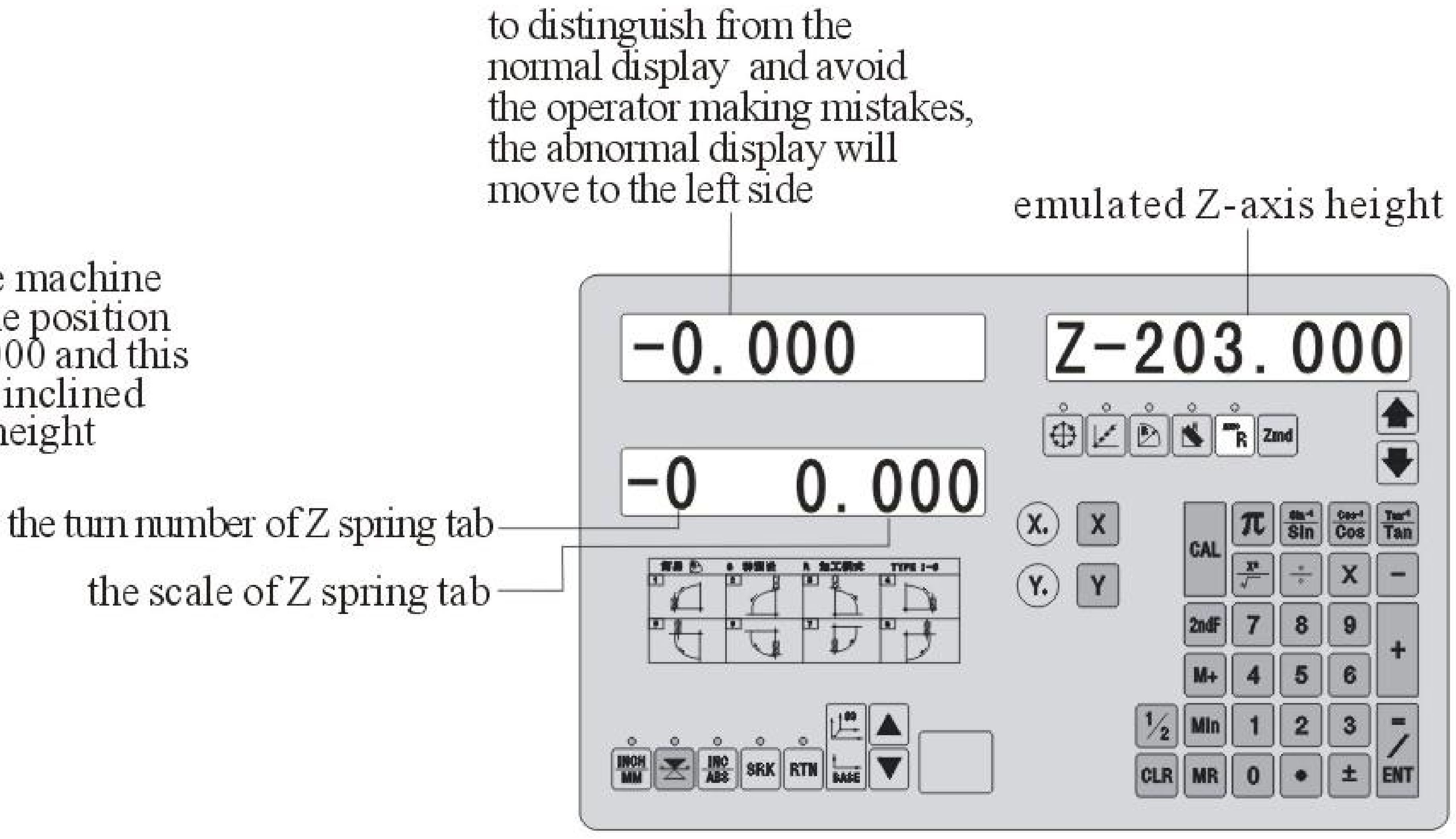
Because two axes digital display do not have Z axis, use ⬆ and ⬇ to simulate Z axis. ⬆ Simulates Z axis UP one step. ⬇ Simulates Z axis DOWN one step. Before the start of ARC cutting, please make sure the tool is posited at the starting point of R and Z axis dial is set to zero.

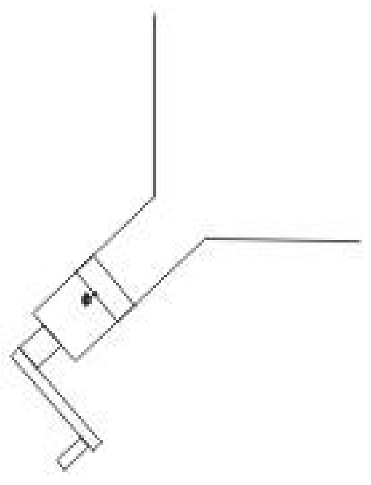
Display and operation of two-axis display under simple R function:

Since no Z axis on the bi-axis digital display, it has to display the spring tab scale and its turn number of Z-axis in the way of emulation on the unoccupied axis. In the course of working, the initial point height of R on Z-axis is set as '0.000'. And in the working course of R machining processing, the spring tab scale and its turn number are automatically transformed from the current machining height of Z-axis, which will lead operator to complete the R processing easily.



move the machine tool to the position of X=0.000 and this height is inclined plane Z height


to distinguish from the normal display and avoid the operator making mistakes, the abnormal display will move to the left side
emulated Z-axis height
-0.000
Z-203.000
-0 0.000
the turn number of Z spring tab
the scale of Z spring tab

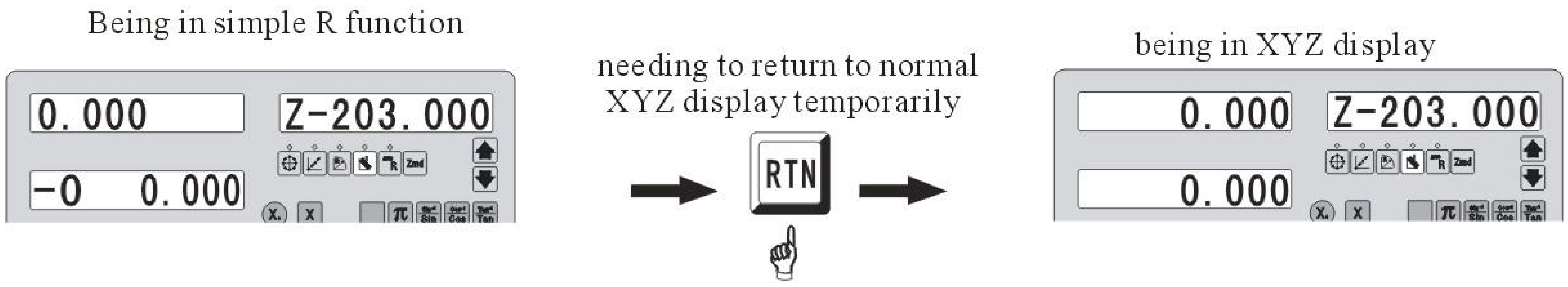


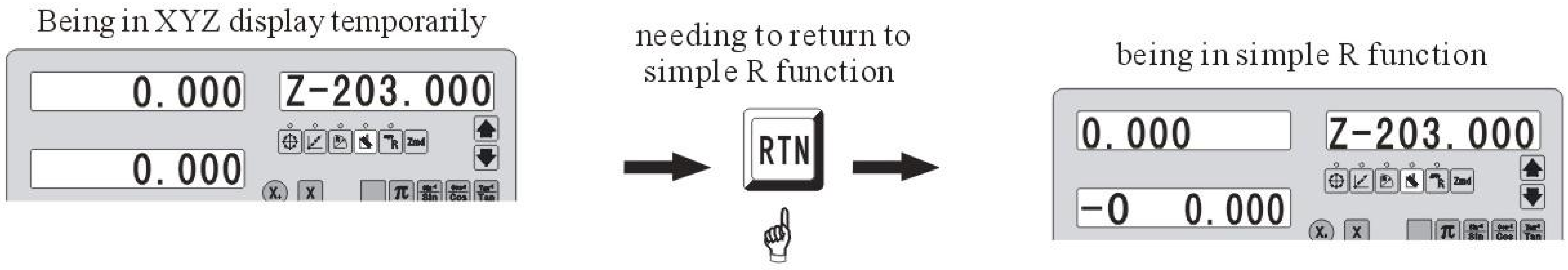
Z-axis spring tab set as 0

Simple R function

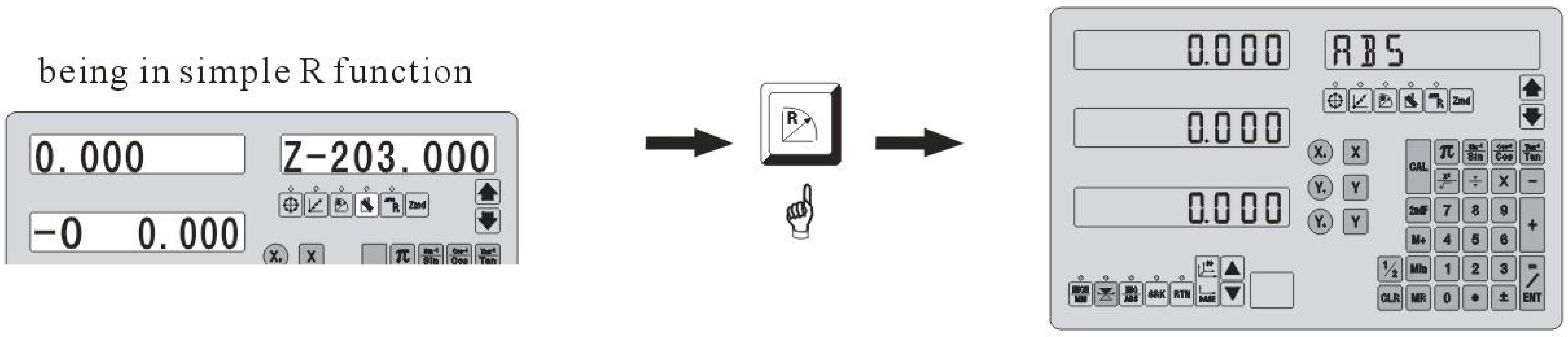
If Z-axis is beyond R scale, Z-axis will display ZOU LI

Anytime if the user wants to return normal XYZ to check the position calculated by the digital display, user can temporarily exit simple R mode.


Being in simple R function
0.000
Z-203.000
-0 0.000
needing to return to normal XYZ display temporarily
RTN
being in XYZ display
0.000
Z-203.000
0.000


Being in XYZ display temporarily
0.000
Z-203.000
0.000
needing to return to simple R function
RTN
being in simple R function
0.000
Z-203.000
-0 0.000

Finish ARC cutting mode and return normal mode.



Note: the above is operating instructions of simple R function on two-axis digital display. Simple R function of three-axis display: except XY cutting plane, XZ and YZ need not input cutting step, as well as press ⬆ or ⬇ . Select cutting step and move Z-axis of grating directly, i.e. the cutting step of Z-axis. The coordinate of X or Y will change with cutting step and move the value to 0.000, i.e. the position of machining.

Shrinkage calculation function

Note: the parameter of shrinkage must be set as 'SRK ON'.
The plastic objects will be shrunk after it is injected into form. When process mould, its real processing dimension must be enlarged or shrunk according to the shrinkage based on the finished products dimension.

1 Setup shrinkage rate

It's important to setup correctly the shrinkage rate because the calculating results depend on multiplying the displayed or input by shrinkage rate.

Shrinkage rate setup: if shrinkage rate=1.005

Operating steps	XYZ display	Auxiliary display	Note
● enter shrinkage calculation function SRK	X Y 1.000	SHRINK	enter shrinkage calculation function and please input shrinkage rate
● enter shrinkage rate 1 . 0 0 5	X Y 1.005	SHRINK	
● confirm this value setup ENT	X 0.000 Y 0.000	SHRINK	end shrinkage function

move grating and the value displayed on each axis is the product by multiplying the dimension of movement and shrinkage rate.

● exit shrinkage calculation function SRK	X 0.000 Y 0.000	ABS	exit shrinkage calculation function and return to normal calculation function

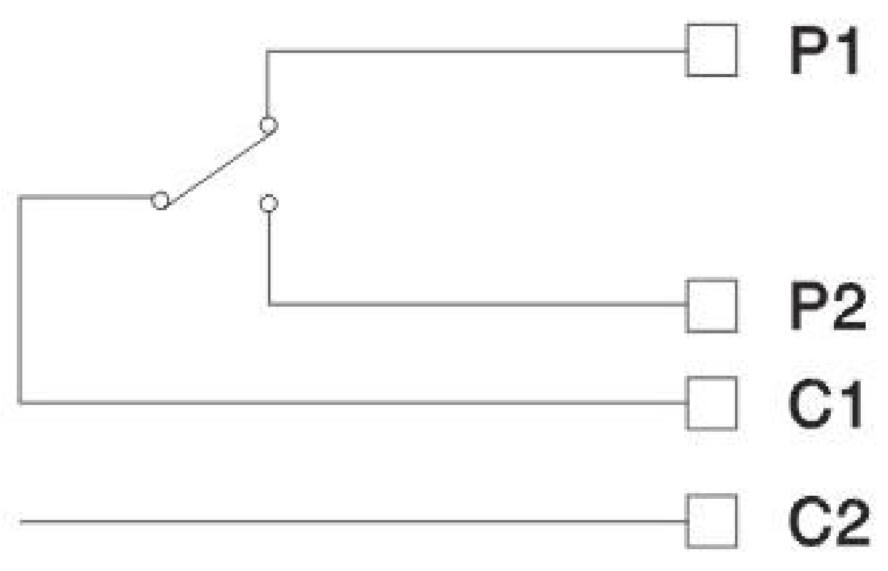
EDM depth control function

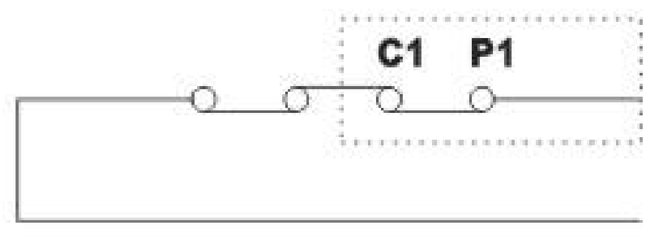
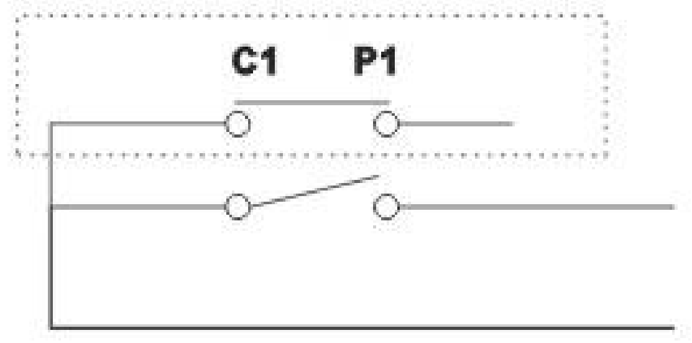
EDM is provided with EDM control function in the Z-axis direction. The functions in the X and Y axis directions are all the same with those of the standard serial digital display.

General function

- Memory function: the special depth function is provided in Z-axis direction.
- Compensation function: to the error caused from electrode wear, it has compensation function.
- Adding/Subtracting function: during machining, the processing depth can be changed in EMD digital display.
- Automatically stop function: when machining to the set terminal depth, the automatic stop signal is sent out to stop Z-axis and digital display.

Connection of control wire



power off Power on Terminal depth value	normally on normally off on	normally on normally off on
		

Definition of cable wire

Definition of cable wire	pin number	cable wire function
P1	1	normally off pin
C1	2	mid pin
P2	3	normally on pin
C2	4	screen line

Example:

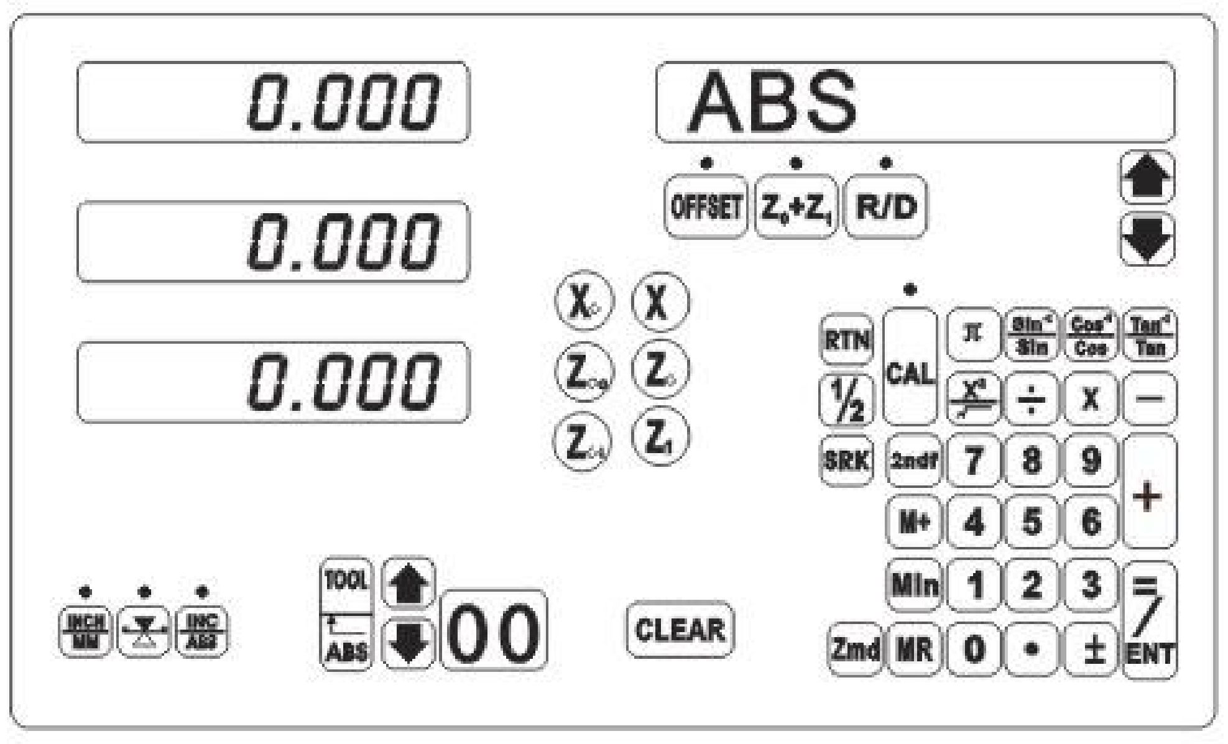
A workpiece machining whose processing depth is 10mm.

Operating steps	XYZ display	Auxiliary display	Note
● Move the tool electrode to initial processing point X Y	X 0.000 Y 0.000	ABS	the reference point setup
☼ DEPTH	X Y 0.000	DEPTH	turning into depth setting

EDM depth control function

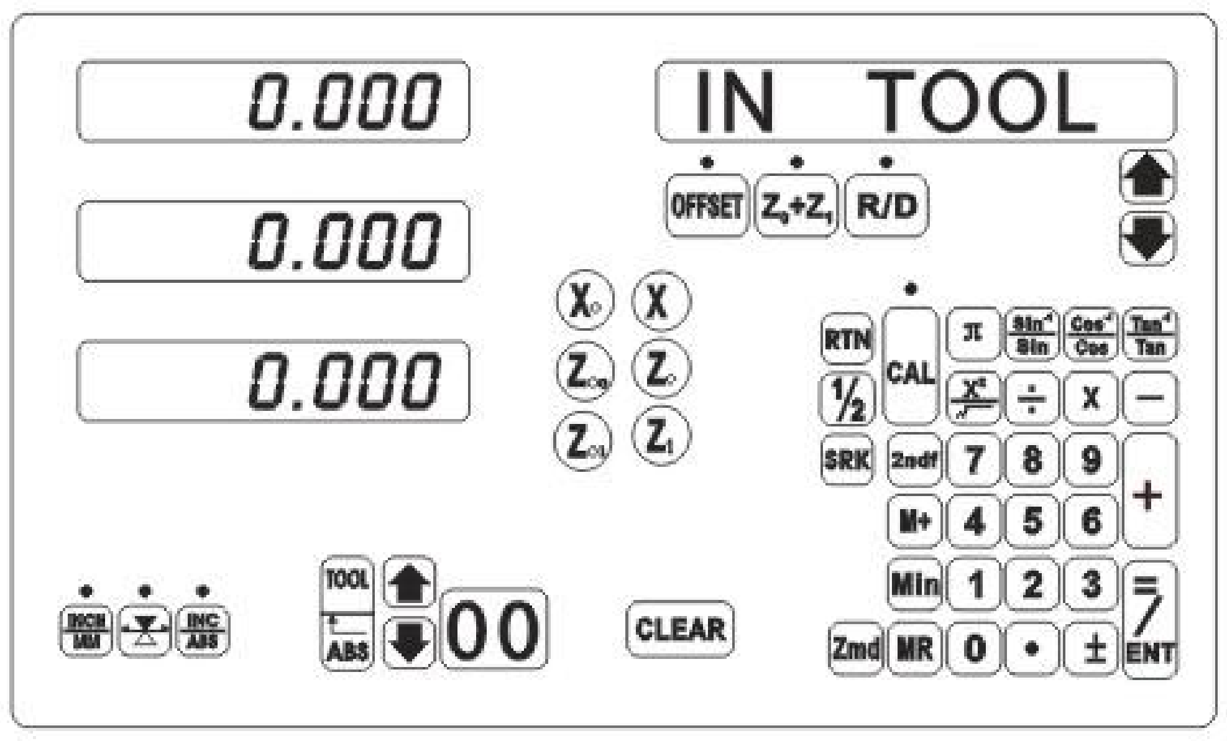
Operating steps	XYZ display	Auxiliary display	Note
1 0	X Y 10 Z	DEPTH	the terminal depth value setting
ENT	X 0.000 Y 0.000 Z 0.000	ABS	the input confirmation and turning into the normal display
● move the tool electrode along the Z direction to the reference plane (zero plane) Z	X 0.000 Y 0.000 Z 0.000	ABS	the reference plane setting
EDM	X 10.000 Y 0.000 Z 0.000	SPARKING	turning into EDM state and starting electrical machining X-axis display the terminal depth Y-axis display the maximal depth Z-axis display the current depth
OFFSET	X Y 0.000 Z	OFFSET	Turning into the electrode wear compensation setting state Compensation range: ±9.995mm
. 6	X Y 0.600 Z	OFFSET	Setting the compensation value. In case of the value as 0.6mm
ENT	X 0.000 Y 0.000 Z 0.000	ABS	Confirming the input and turning into the normal display
● Processing completed or during processing EDM	X 0.000 Y 0.000 Z 0.000	ABS	Back to the normal display from the EDM state.

Lathe function



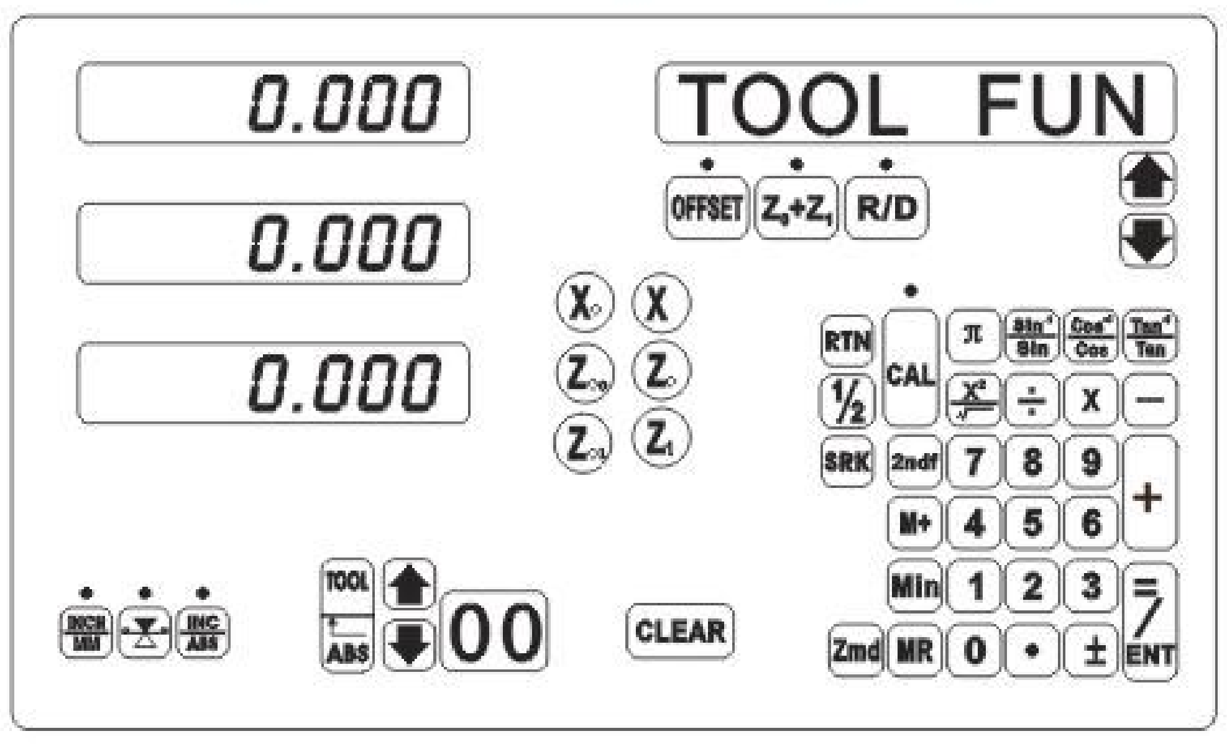
一、TOOL/ABS ，tool compensation ON/OFF

- press TOOL/ABS , switch on tool compensation function
- press ⬆ or ⬇ key to select number of tool
- press TOOL/ABS again to exit tool compensation function



二 OFFSET , set tool compensation dimension

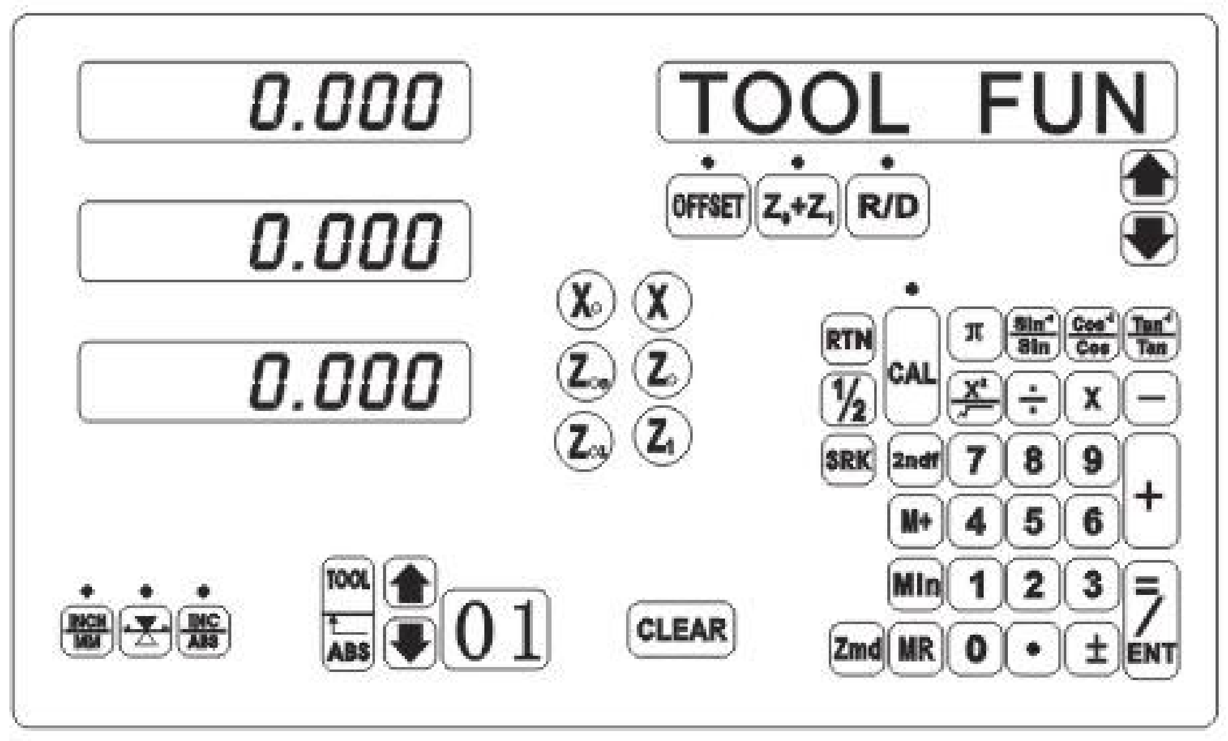
- press offset, enter tool compensation dimension set mode
- enter number of tool by numerical keys or ⬆ or ⬇ key
- press Z , numerical keys, ± , ENT to set compensation dimension
- press offset to exit



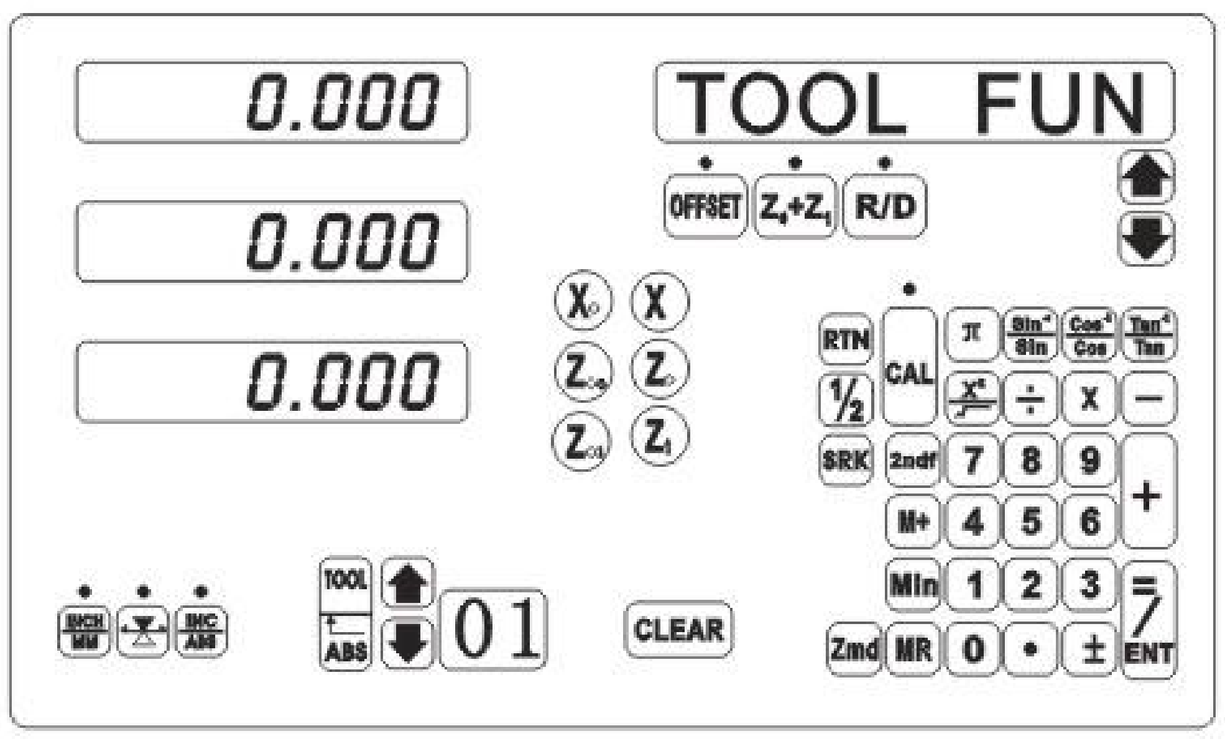
Example： Tool compensation
offset=10 and number of tool=01

Operating steps:

1 press OFFSET to enter



2 press ⬆ to select tool 01



3、press Z0、1、0、ENT、

TOOL 01
10.000

00

IN OFFSET

4、press OFFSET to return

10.000
00.000
00.000
01

ABS

三、Z0 ± Z1 (only valid for 3-axis display)

The key is used to select third axis (Z_1) display mode. It switches display between Z_1 and $Z_0 \pm Z_1$. When $Z_0 \pm Z_1$ is selected, LED is on and the value displayed moves forward.

四、R/D

The key is used to select diameter or radius of X axis. When D is selected, LED above it is on.

Specifications:

Number if axis: 1, 2, 3

Resolution: 0.005/0.001/0.01

Display function: 8 LED

Response speed: 60mm(198.6 feet)/min

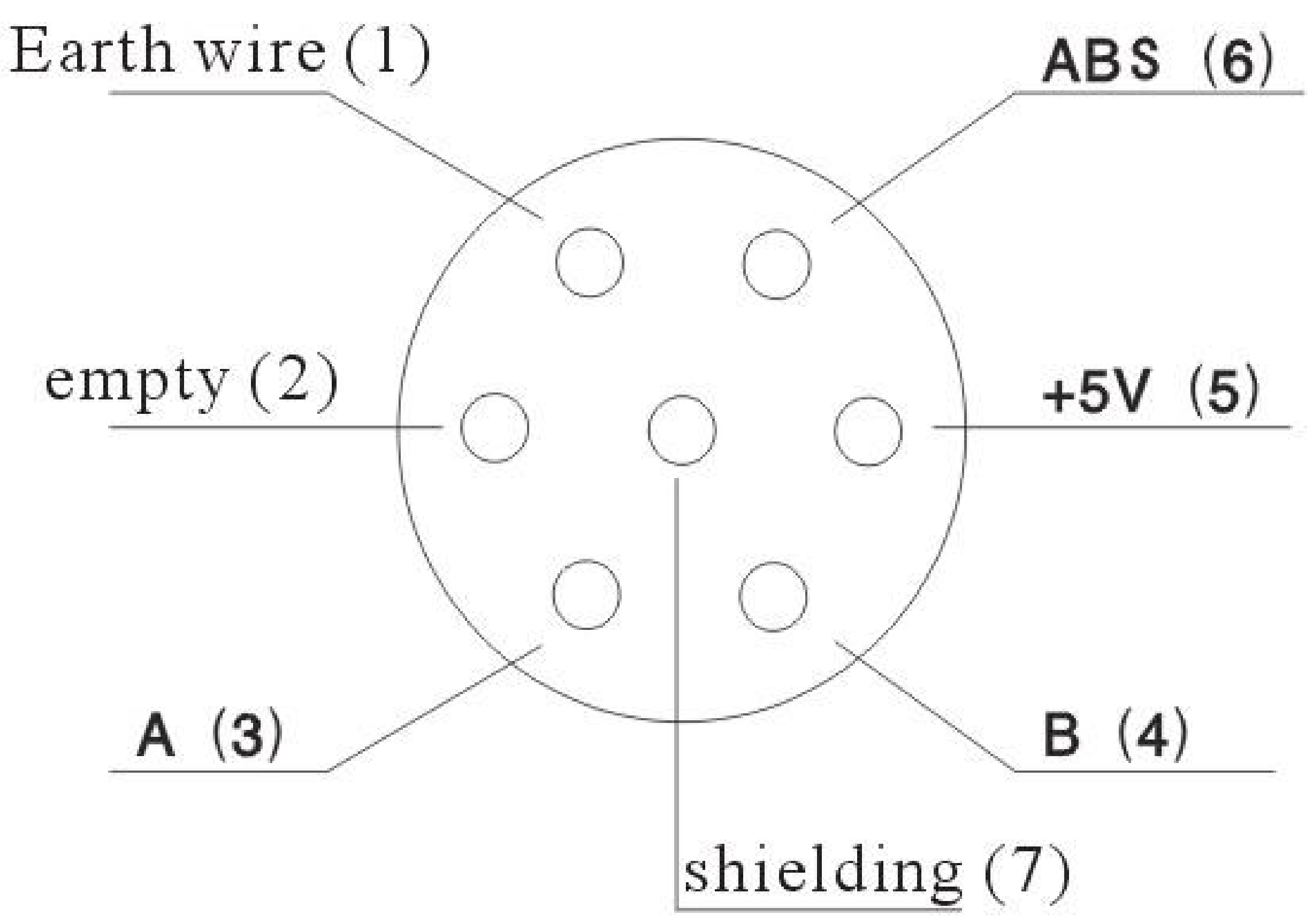
Quantizing error: ±1

Power source: Ac110~240V 50~60Hz 30VA 0.5A

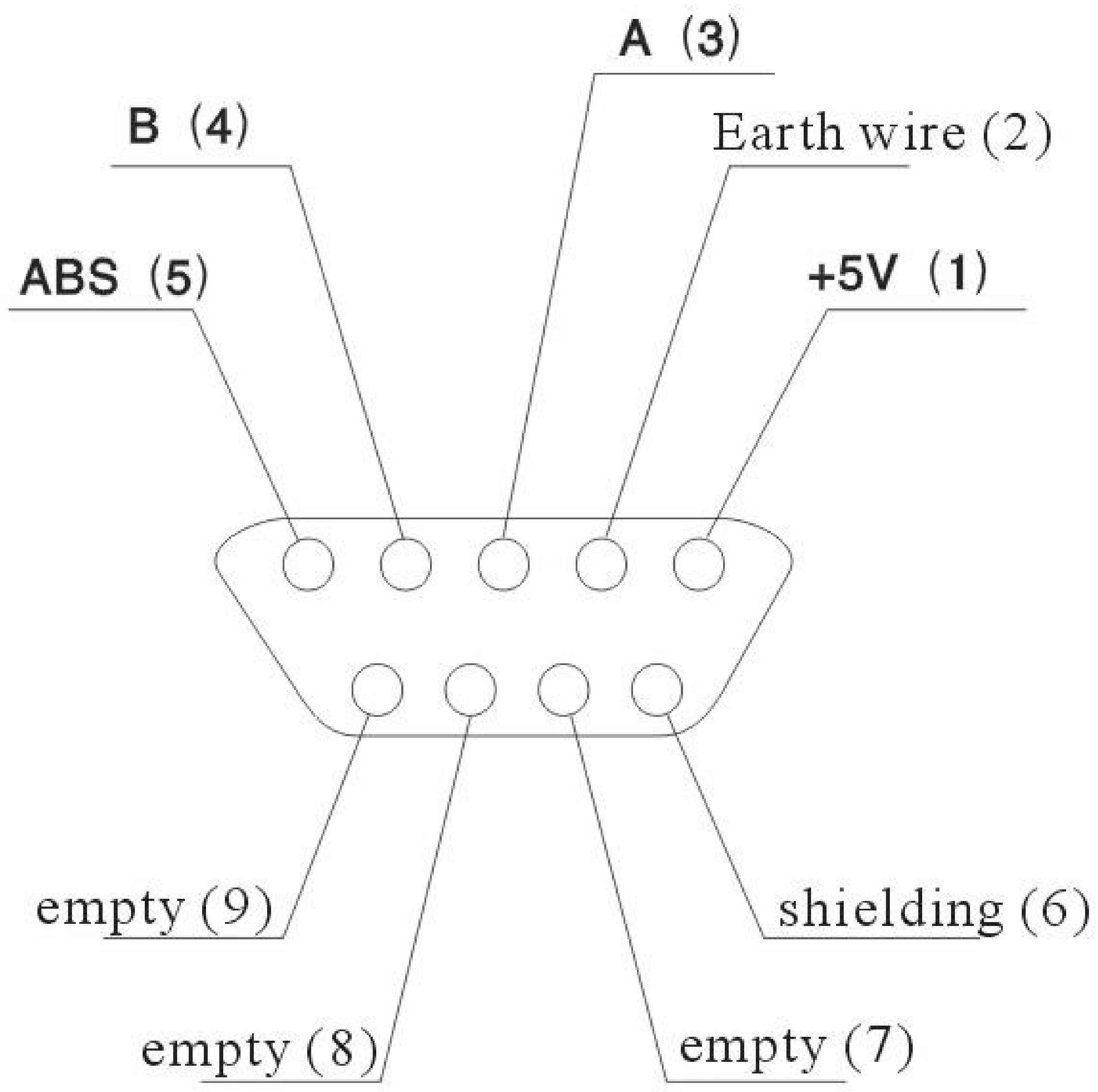
Temperature range: Service: 0~40°C/ storage: -20~70°C

Input signal :TTL square wave

Type of display	Volume	Weight
Bc11	314x194x100	2.65kg
TOP20	265x182x48	1.1kg
Bc10	290x190x105	2.85kg



7 pin



9 pin

Estimation and treatment for common failures

No display

1 Look over if the power plug keeps in good contact with the outlet

2 Look over if the fuse is melted

3 Look over if the voltage meets the requirement, namely 110V or 220V

Shell charged

Earthing is not good: the tool is connected with the meter bar, which should be connected to the earth. With rubber mat in the tool leg, the earth wire of the power source must be connected well with the power line. Otherwise, low voltage power source will affect operation.

The displayed number is unchangeable

1 if all numbers on X, Y, Z axes are unchangeable, reset the system. Please refer to the system reset part in the manual.

2 please look over if the connector stays in good contact with that of the grating.

3 if the failure happens on just one axis, make this axis connected with another grating to test whether grating or display is abnormal

The displayed number on display is not accurate: doubled or too large

1. Accuracy of guide rail of the tool is not good

2. Installation of grating doesn't meet the requirement and parallelism has not been adjusted. Each part has not been firmly fixed.

3. Resolution of grating does not match actual resolution.

4. Compensation dimension of linear error is wrongly set.

5. Grating is broken and some number is missed.

6. Please refer to the system reset part in the manual.

The counting direction of display is opposite to the practical direction

Please refer to the scale moving direction setting part of the manual to change the counting direction.

If the problem is not solved after treating by the above way, please contact with the agent or the manufacturer. Never open the case to fix by yourself.

Additional information

Since the version of this system will upgrade, some functions may be added or for special use. Therefore, increased functions will be illustrated in the following table.

increased function 1	operating instructions
increased function 2	operating instructions
increased function 3	operating instructions